Aberdeen Free Press. May 12 1902

EDUCATIONAL.

"A Text-Book of Medical Jurisprudence, Toxicology, and Public Health," by John Glaister, M.D. D.P.H. (Camb.), Professor of Forensic Medicine and Public Health in the University of Glasgow (Edinburgh: E. and S. Livingstone—15s).—Provided with 238 illustrations, Professor Glaister's book includes in its 820 well-filled pages three great subjects usually treated in separate volumes. The subjects are now conjoined for examination purposes, and there is an obvious convenience in having them brought together in a comprehensive manual. "As regards range of topics all that is claimed is that it comprehends many of the most important problems in each of the departments of which it treats. Its aim is to be a practical guide to the chief relationships of the members of the medical profession to the State as regards both the criminal and civil law, and to give a fairly adequate exposition of the principles and practice of Public Health. Nor have the needs of the legal profession been overlooked." Many references will be found to legal cases, text-books, and Acts of Parliament in their relation to medico-legal questions and decisions. Professor Glaister has the advantage of superadding to his groundwork of special study a long experience in medico-legal practice, in the course of which he has accumulated a larger store of illustrative material from which has been drawn much that contributes to the utility of his volume. As a students' text-book it will have much vogue. While explicit, luminous, and terse in exposition, it is practical and instructive in illustration, and is in all respects a well-appointed and purpose-like work.

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Scotsman. May 26. 1902

A Text-Book of Medical Jurisprudence, Toxicology, and Public Health. By John Glaister, M.D., D.P.H., F.R.S.E., Professor of Forensic Medicine and Public Health, Glasgow University, &c. &c.

The dedication by Professor Glaister of his textbook of Medical Jurisprudence, Toxicology, and Public Health to "M. S. G. for her patient forbearance, kindly sympathy, and stimulating encouragement during many literary effort" proves, apparently, that devotion to work has interfered with home duties. However, the ill-wind blows for the public's good, for the latest outcome of his labour is most excellent. The author has sought to continue in one book consideration of the three subjects—Forensic Medicine, Toxicology, and Public Health—in a form suitable for students, practitioners, and lawyers; and to effect this within a reasonable length. Last year in a notice in these columns of Professor Vivian Poore's treatise on Medical Jurisprudence especial praise was given it for the interesting and colloquial style in which the subject was discussed. In fact it told the story. Professor Glaister tells more than a story; he gives us facts, details, and references in full without adornment; clearly, while concise, he entered; a storehouse of information. From the first type of book the beginner learns more; from the second a more experienced man finds the data required to guide him when actually called on to apply his knowledge. Professor Glaister has had a long and varied experience of all the subjects he treats of, and he makes good use of it. He wisely, considering the plan of the work, abstains from condescending to too many details in his description of illustrative cases; giving references rather to the best sources of information. He has introduced 23 figures into the text; many excellent, some good, and a few only "not so bad." The figures belonging to the last category chiefly err in their lack of proper scale; some, however, are most indistinctly printed. Examples could be given to show the thoroughly practical character of the work, and the wide extent of subjects treated of. To specify all the matters discussed in its pages would take up the greater part of a column; sewage, food and water supply, ventilation, hospitals, poisons, even to tansy and pennyroyal, lunacy, &c. &c. are in turn shortly, clearly, and expertly dealt with. One or two minor mistakes in nomenclature and spelling are present, but of little importance. The general value of the book is undoubted, especially as regards Scotland, and it should certainly form the vade mecum for all those connected with the subjects which it were folly to be without.

"A Text-Book of Medical Jurisprudence, Toxicology, and Public Health." By John Glaister, M.D., D.P.H. (Camb.), F.R.S.E., &c. Illustrated. (Edinburgh: E. & S. Livingstone.)

This text-book will add a welcome unit to those with which Professors of the Faculty of Medicine in the University of Glasgow have enriched the literature of the profession. Cleland's "Anatomy" and Coats's "Pathology" are examples of standard works of extreme importance to the student, and Professor Glaister's "Medical Jurisprudence" is fit to rank with these works as an able exposition of medical law. He has the advantage of being able to draw on a copious fund of experience by way of illustrating the points he brings forward, and it is teaching of a practical kind which is eminently desirable in the subject whereof he treats. To know how to give evidence clearly in a witness-box, to understand how to write a medico-legal report, to be fortified against the cajoleries of cross-examining counsel, to know how to make a post-mortem examination, and to trace out, like a detective, the signs of a crime, are all points of import in the training of the medical man. It is to the elucidation of such matters that Dr Glaister addresses himself. We think he somewhat handicaps himself by including "Public Health" in this bulky volume, for there are many excellent and special manuals of hygiene at the service of the student. In this health section of his book we find re-echoes of a certain other manual by the author, who, although his space has been limited, contrives to present a fairly adequate view of the relations of the medical man to public health at large. The purely jurisprudence section of the book is very equal in its merits. All the subjects are treated in a clear and practical manner, from the procedure in criminal cases to the investigation of lunacy. The section on "Wounds" strikes us as being very admirably written, as also is the whole section on "Toxicology." A novel feature in this work, as compared with similar works published in former years, is the description of the Bertillon method of identification, and of Galton's finger-print system. The illustrations are numerous, many consisting of photo. reproductions, and therefore giving lifelike pictures of the various objects or features detailed. Altogether, Dr Glaister may be congratulated on having produced a very useful text-book, and one to which both the medical student and practitioner may turn for information with all confidence.

British Medical Journal 5 Nov. 1904 p. 1536.

REVIEWS.

FORENSIC MEDICINE.

THE two main points in which Dr. GLAISTER's *Textbook of Medical Jurisprudence, Toxicology, and Public Health*[1] differs from others on the subjects are that, on the one hand, both forensic medicine and public health are dealt with in the same volume, and, on the other, that these matters are treated in as practical a manner as possible by the free use of diagrams and illustrations. Public health and medical jurisprudence, however, have in reality very little in common, far less, in fact, than have mental diseases and forensic medicine, on the one side, and public health and the zymotic and occupation diseases on the other. That this is the case, can be seen from Dr. Glaister's own book, for though included within the same covers, the subjects are kept absolutely distinct, and might just as well have formed two independent volumes. With regard to the second characteristic, however, the author has been very succcessful, for the book is full of practical hints and useful diagrams. After the usual introductory chapter, we find one entitled Legal Criminal Procedure, in which the differences that exist between the English and Irish forms, and the English and Scottish are fully described; and a careful summary of the Acts concerned, and of the responsibilities, duties, and fees appertaining to medical witnesses in the various courts of justices is given. The questions connected with "professional secrecy" are thoughtfully considered, and the present state of the law, as demonstrated by recent cases in the law courts, is described. Amongst the subjects which in most books on forensic medicine are but scantily discussed, but which Dr. Glaister has described in detail, are the following: anthropometry, including identification by fingerprints, by relative measurements, by scars, by tattoo marks, by footprints, and by handwriting; the duties of medical referees under the Workmen's Compensation Act; the laws relative to death certification; the differential diagnosis of states of insensibility; and the laws relating to the sale of poisons. The haemolytic test for blood is mentioned but not very fully described. Arsenic naturally receives very considerable attention, as also does copper, in connexion with the "greening" of vegetables. Amongst other subjects which are specially well treated mention may be made of pregnancy in its medico-legal aspects, lunacy, the various difficulties met with in the identification of the living, and the subject of vegetable poisons. The various other matters included under the heads of medical jurisprudence and toxicology are also well and fully described, but do not call for any special remark. In the portion of the book devoted to public health, the author commences with a short introductory historical sketch and a list of the various Acts both in England and

[1] *A Textbook of Medical Jurisprudence, Toxicology and Public Health.* By John Glaister, M.D., D.P.H., F.R.S.E. Edinburgh E. and S. Livingstone. 1902. (Demy 8vo, pp. 842. 15s.)

Scotland with which the medical officer of health should be acquainted, and then proceeds to discuss questions connected with vital statistics and statistical returns. This chapter is very complete, and not only contains much information, but also gives tables and formulae for the compilation of reports that they may as nearly approach accuracy as possible. A

The author's
Copy.

May. 1902.

The Lancet Review 31st May 1902.

A Text-book of Medical Jurisprudence, Toxicology, and Public Health. By JOHN GLAISTER, M.D. Glasg., D.P.H. Camb., F.R.S. Edin., Professor of Forensic Medicine and Public Health in the University of Glasgow, &c. With 238 illustrations. Edinburgh: E. and S. Livingstone. 1902. Pp. 820. Price 15*s*.

IN this work the plan has been adopted of combining in a single text-book the subjects of medical jurisprudence, toxicology, and public health. We consider this method a good one both for practitioners and students. All three subjects imply relationships subsisting between the medical man and the State and at most of the qualifying examining boards the subjects are now conjoined for examining purposes. Dr. Glaister modestly remarks that on none of the subjects does the volume pretend to be exhaustive. He has, however, produced an excellent manual, fully carrying out all that is claimed for it—that is to say, that in its pages will be found a consideration of the most important problems in each of the departments of which it treats.

The experience gained by the author in the field of medico-legal work and practice and in the teaching of the subjects comprised in the book for many years has convinced him that the kind of book most needed by practitioners and students alike is one which combines the exposition of principles with practical details. On this point we entirely agree with him. Unless interspersed with illustrative cases a text-book on forensic medicine is found to be somewhat uninteresting reading. If, however, certain cases are selected and are then compared with theoretical considerations valuable lessons are acquired. Not only will the student more readily grasp the principles of the science, but he will gain an insight into the manner in which medico-legal cases should be conducted and will be warned against the many pitfalls into which an inexperienced medical witness or officer of health may fall.

The book is divided into three sections. Section I. deals with Medical Jurisprudence. The earlier chapters describe legal criminal procedure in England, Scotland, and Ireland and the methods which should be adopted by the expert witness when giving evidence in court. The vexed question of professional secrecy is ably discussed. It is interesting to note that medical men in certain parts of the world are in different positions in this matter. In England a medical witness must disclose, when a judge so rules, any secret information of which he may be possessor by virtue of his professional relationship to a party in the case. In New Zealand, on the other hand, all communications made to a physician or surgeon in his professional character by any of his patients are held to be privileged and are not admissible in evidence in any civil or criminal proceedings, except with the express consent of the person who is alleged to have made such communication; a similar rule prevails in certain American States.

The chapter on Personal Identity is also well arranged. Full accounts are given of the methods employed in the identification of prisoners by the Bertillon system and by the finger-print systems of Galton and Henry. The chapter on the Medico-legal Forms of Death—namely, drowning, suffocation, hanging, strangulation, and throttling—contains a full account of the appearances which may be present in such circumstances, together with the deductions which may be drawn from them. Other chapters deal with Death

by Lightning and Electricity, Death by Cold and Exposure, Wounds in their Medico-legal Bearings, and the Examination of Blood-stains. The medico-legal relations of the sexual functions, rape, and infanticide are also duly discussed.

A useful and instructive chapter is one on the Differential Diagnosis of States of Insensibility, a subject which frequently comes under the notice of the resident medical officers of the general hospitals and which occasionally presents problems of the greatest difficulty. The chief points are described upon which an opinion may be formed, but the main object of the chapter is to warn the young practitioner against coming to a too hasty conclusion. The instruction given to house surgeons and house physicians never to send away an unconscious patient is a good and sound one and should never be departed from.

Section II. is concerned with Toxicology and an account is given of the symptoms, mode of detection, and treatment in cases of poisoning by organic and inorganic substances. The directions given for chemical analysis are unusually full and complete.

Section III. is headed "Public Health." The high standard of description and reasoning exhibited in the previous parts of the book is fully maintained in this section. The chapter on Air and Ventilation is particularly worthy of attention and the principal appliances which are adopted for the ventilation of closed spaces, large and small, are described in detail. Especial attention is paid to the mode of testing practically schemes of ventilation and the information thus given should prove of considerable value to medical officers of health and to those practitioners who are charged with the supervision of workshops and factories. The subject of house drainage is likewise dealt with at length, as are also those of sewage disposal and methods of sewage destruction.

Some interesting chapters are added which are not always to be found in a text-book of this nature. Chapter 9 is headed "Preventable Diseases." Brief accounts are given of the mode of spread of the infectious diseases, particular attention being drawn to yellow fever, plague, and malaria. Then follow chapters on Methods of Prevention of Infectious Diseases and Modes of Disinfection of Individuals, Clothing, and Rooms. The sanitary law relating to infective diseases is also explained. Chapter 13 is concerned with the Construction and Requirements of Isolation Hospitals and the final chapter deals with the Effects of Occupation on Health and the Duties of Medical Practitioners regarding Industrial Poisoning.

Taking this work as a whole we can unhesitatingly pronounce it to be one of the best text-books dealing with medical jurisprudence, toxicology, and public health which we have met with. It is well written throughout, the information contained in it is full and accurate without being redundant, and the illustrations are appropriate and well executed. We can cordially recommend it to medical practitioners and students and also to members of the legal profession who will find therein a useful guide in a class of cases which are often perplexing to the legal mind.

new), and the surgery of the abdomen. The whole section devoted to the operations on the stomach is new.

The description of most of the operations is still meagre, but greatly assisted by the beautiful illustrations. Again we have pleasure in recommending the book to those preparing for the higher examinations.

Dublin Monthly Surgical Journal

A Text-book of Medical Jurisprudence, Toxicology, and Public Health. By JOHN GLAISTER, M.D., D.P.H. (Camb.); F.R.S.E.; Professor of Forensic Medicine and Public Health in the University of Glasgow; Fellow of the Faculty of Physicians and Surgeons, Glasgow; Licentiate of the Royal Colleges of Physicians and Surgeons of Edinburgh; Examiner in Medical Jurisprudence and Hygiene to the Royal Colleges of Physicians and Surgeons, Edinburgh, and the Faculty of Physicians and Surgeons of Glasgow for Diplomas in Medicine and Surgery, and Examiner in Public Health for the Diploma in Public Health for these United Corporations; Senior Medico-Legal Examiner in Crown Cases for Glasgow and Lanarkshire, &c. With 238 Illustrations. Edinburgh: E. & S. Livingstone. 1902. Pp. 820.

THIS volume deals in a lucid manner with the subjects named on its title page.

The portion of the work which deals with Medical Jurisprudence occupies 382 pages, and contains records of many cases which have occupied the attention of the Law Courts in recent years in which medical evidence has played an important part.

As befits a work written by a Glasgow professor, much space is devoted to the consideration of Scots law. At the same time the requirements of the English reader are not ignored.

Under the heading of "Personal Identity," the Bertillon, Henry, and British systems of identification of criminals are described in a clearer manner than we have elsewhere come across.

The gruesome details of some aspects of medical juris-

Glasg. Med. Journal. Vol LVIII. No 4
October 1902.

influences, supposed to play an important part in epilepsy, could have something to do with the production of such an eruption?

Dr. Wyllie Nicol regretted that he was unable to say what the cause was. The suggestion of Dr. Oswald might gain some support from the similarity in certain points between the naked-eye and microscopic appearances in this case and those in an early stage of rhinophyma. In rhinophyma, a toxæmia was frequently associated with the other causes. The feeling is that, although not usually observed at birth, the present affection is congenital, and should be classed amongst the nævi.

II.—SYMPHYSIOTOMY: REPORT OF A CASE OF CONTRACTED PELVIS AND PREGNANCY, TERMINATED AT FULL TIME BY SYMPHYSIOTOMY.

By Dr. W. G. Dun and Dr. A. W. Russell.

Drs. Dun and Russell's paper will be found as an original article in our issue for September, 1902, at p. 180.

III.—THYROGLOSSAL DUCT CYST.

By Dr. G. H. Edington.

Dr. Edington showed a specimen of a tubular cyst with dilated lower extremity, removed from the subcutaneous region of the neck of a lad, æt. 17. It was said to have appeared two years previously, after ulceration of the mouth.

Microscopic examination was made by Dr. Teacher. The dilated lower end proved to be a chronic abscess not connected with lumen of tube. The tubular portion was lined with epithelium—in parts, columnar ciliated.

REVIEWS.

Medical Jurisprudence, Toxicology, and Public Health. By John Glaister, M.D. Edinburgh: E. & S. Livingstone. 1902.

The publication of Professor Glaister's work marks a new era in the literature of forensic medicine, and it is not too much to say that it is one of the best text-books on the subject

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A TEXT-BOOK OF
MEDICAL JURISPRUDENCE
TOXICOLOGY
AND
PUBLIC HEALTH

BY

JOHN GLAISTER, M.D., D.P.H. (CAMB.), F.R.S.E.

Professor of Forensic Medicine and Public Health in the University of Glasgow; Fellow of the Faculty of Physicians and Surgeons of Glasgow; Licentiate of the Royal Colleges of Physicians and Surgeons of Edinburgh; Examiner in Medical Jurisprudence and Hygiene to the Royal Colleges of Physicians and Surgeons of Edinburgh, and the Faculty of Physicians and Surgeons of Glasgow for Diplomas in Medicine and Surgery, and Examiner in Public Health for the Diploma in Public Health of these United Corporations; Senior Medico-Legal Examiner in Crown Cases for Glasgow and Lanarkshire, etc.

With 238 Illustrations

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FOR HER PATIENT FORBEARANCE, KINDLY SYMPATHY,

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DURING MANY LITERARY EFFORTS,

THE AUTHOR GRATEFULLY DEDICATES

THIS VOLUME.

PREFACE.

In the following pages the experiment has been tried of combining in a single Text-Book or Manual the subjects of Medical Jurisprudence, Toxicology, and Public Health. All three subjects imply relationships subsisting between the medical practitioner and the State: and at most of the qualifying Examining Boards the subjects are now conjoined for examining purposes. To have them treated in the same text-book may therefore be found to be a matter of convenience, especially for the Student of Medicine. On none of the subjects does the volume pretend to be exhaustive. As regards range of topics all that is claimed is that it comprehends many of the most important problems in each of the departments of which it treats. Its aim is to be a practical guide to the chief relationships of the members of the medical profession to the State as regards both the criminal and civil law, and to give a fairly adequate exposition of the principles and practice of Public Health. Nor have the needs of the legal profession been overlooked. Many references will be found to legal cases and text-books, Acts of Parliament and the like, in their relation to medico-legal questions and decisions. To the legal practitioner and law student therefore it is hoped that the book may afford a useful guide in a class of cases often perplexing to the legal mind.

The experience gained by the Author in the field of medico-legal work and practice for a quarter of a century and in the teaching of the subjects treated of in this Manual for over twenty-one years has convinced him that the kind of book most needed by practitioners and students alike is one which combines the exposition of principles with practical details. His experience as a teacher has also shown him the greater need than has hitherto been provided for of illustrating the exposition of the subjects considered. Out of the large store of material therefore which the author has accumulated during the above-named period, he has selected some for illustrating this volume.

In the preparation of these pages he has to acknowledge most gratefully assistance received from several sources. It would be impossible, however, to do this individually. To some he is indebted for the use of certain illustrations, the sources of which are indicated

in the text. To others he is a debtor for suggestions. To all of these he now tenders his warm thanks. But special acknowledgment must be made with cordial appreciation and gratitude to two of his friends who have rendered more signal service: To Dr. Arbuckle Brown, his University Assistant, for much painstaking labour in the drawing and preparation of illustrations, reading of proofs, and compilation of indices; and to Alexander Duncan, Esq., B.A., LL.D., Secretary and Librarian of the Faculty of Physicians and Surgeons of Glasgow, for his kindness in the arduous task of proof-reading and for much literary assistance, the Author tenders his most cordial thanks. In conclusion, he further desires to express his acknowledgments to the publishers who have spared neither time, trouble, nor expense in presenting this volume to our readers.

University of Glasgow,
18*th April*, 1902.

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Feb. 28. 1905

University College,
Dundee.

My dear Glaister,

Very many sincere thanks for your most valuable & interesting books. I am most delighted to have them, not only because they are a compendium of information in a subject upon which I desire, & I may truly, much need instruction but also on account

—Aconite—Aconitin—Symptoms—Lamson Case—Post-Mortem Appearances —Chemical Analysis—Strychnia—Symptoms—Post-Mortem Appearances—Treatment—Chemical Analysis—Digitalis—Symptoms—Post-Mortem Appearances—Chemical Analysis 449–493

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MEDICAL JURISPRUDENCE.

SECTION I.

MEDICAL JURISPRUDENCE.

CHAPTER I.

LEGAL CRIMINAL PROCEDURE.

Medical Jurisprudence, Forensic Medicine, Juridical Medicine, Legal Medicine, and State Medicine, are some of the designations of that science which correlates medical knowledge to the purposes of the law; and the term "medico-legal" is used in connection with such words as "report," "knowledge," "skill," "testimony," to signify the practical application of this knowledge. The precise kind of knowledge which may require to be brought to bear upon any particular legal problem having in it relations to the science and art of medicine must, however, be of the most varied character. Chemistry, Botany, Materia Medica, Anatomy, Physiology, Midwifery, Medicine, Surgery, and Pathology, in addition to other departments embraced in the training of the modern practitioner may, therefore, be laid under contribution: Chemistry, in cases of poisoning and in cases of corrosive fluids applied externally; Botany and Materia Medica, in the detection of poisonous plants, and in the recognition of official or other preparations of drugs; Anatomy, in the recognition of parts of human remains, and in the differentiation of the bones of the lower animals and man; Physiology, in the estimation of the effects of growth upon the human body, and their modifications under special circumstances; Midwifery, in cases of feigned pregnancy, in the determination of the duration of the period of gestation, and of the signs of pregnancy, in criminal abortion, in sterility, and in the determination of virginity; Medicine, in the differentiation of diseases from the effects of poison, and in many other relations; Surgery, in the determination of the causes and characters of lesions, the result of violence applied to the body; and Pathology, in the dissection or post-mortem examination of the body in cases of suspicious death from any cause, and the differentiation of normal from abnormal conditions. Besides, in certain kinds of medico-legal cases it will probably happen that aid may require to be invoked from more than one of these departments in the elucidation of truth regarding any given case.

Since no medical practitioner can help himself from being called upon to render such assistance as the law may require of him, it behoves the student of medicine to diligently study the various prob-

lems which the subject offers. There are those who, entering upon the duties of a medical career, hope that it may never be their lot to become witnesses in medico-legal cases, or to become acquainted with the atmosphere of a court of law, and still less with, what appears to them, the disagreeable and uncomfortable environment of the witness-box. This, however, is but a fond delusion in the large majority of cases. It ought to be recollected that a medical practitioner presents a two-sided relationship to the State; first, as a physician or surgeon, the healer of disease, and second, as something of a forensic expert, whose professional watchfulness and acumen are expected to prevent crime from going undetected, and, at the same time, to protect the innocent from unfounded criminal charges. Indeed it may be said with tolerable certainty that so soon as a man starts upon his medical career, whether as a hospital assistant, general practitioner, or as specialist, he is liable to be called upon to render professional services in cases in which circumstances may, later, compel his attendance in the witness-box.

While it is the prime aim and object of the physician and surgeon to cure, and to save life, the medical jurist has to deal with problems ahead of these efforts; for example, while his immediate duty in a given case of cut-throat is to save the life of his patient, it may be required of him to give an opinion whether, from the character of the wound and other facts, such wound was inflicted suicidally or homicidally, and, if the former, whether the person, at the time the wound was inflicted, was or was not of unsound mind. Moreover, he has a relationship to the dead as well as to the living. The body of a man, let us say, has been found. The criminal authorities call upon a practitioner to guide them as to their future action by giving an opinion whether the death was due to natural or unnatural causes, and if the latter, what was the cause; or, the dead body of a person is taken out of the water, and he is called upon to pronounce an opinion as to whether the person died in the water from the effects of submersion, or whether the body had been thrown into the water after death to hide the real cause of death, and to suggest that drowning was the cause. These and many like problems are largely solved by the aid of medical knowledge. A medical man, called to act in any of these relations, must be particularly alive, therefore, to the importance and gravity of the situation; for any mistake in his judgment may cause the punishment of the innocent, or the escape of the guilty. In view of the foregoing considerations, therefore, the medical practitioner must cultivate the habit of rapid, accurate, and close observation, and must develop the qualities of the logician in the application of his science to a body of facts: having acquired these, his judgment is likely to become less liable to error; it is certain to be honest; and he will be in a position to give good reasons for the opinions he offers.

MEDICAL EVIDENCE.

From a long practical experience with criminal law-courts in connection with medico-legal work, and from observation over a long period of the ordinary medical witness as a giver of testimony, we

have arrived at the conclusion that one principal ground upon which it has been freely said by judges and members of the bar that medical men usually make bad witnesses, is a want of knowledge of legal procedure on the part of medical men, coupled with a want of familiarity with law-courts and a legal atmosphere. This may, in great measure, be overcome by the student taking every opportunity of being present in criminal courts when cases of medico-legal interest are being tried. There is, however, a more important reason which, in our view, accounts for the awkwardness of the young medical witness, and that is, the entire absence of practical illustration of theoretical teaching of Forensic Medicine which, too generally, prevails in our Medical Schools. Although this is essentially a practical subject, and only attains its value when applied to practice, it is about the only one which the student has few opportunities of seeing in practical operation, and too frequently it is expected of him to know the subject by listening merely to lectures.

To remove the former difficulty, the subject of legal procedure, in so far as it throws light upon the position of the medical witness, shall be first considered.

LEGAL CRIMINAL PROCEDURE.

I. In England and Ireland.—Since in these divisions of the kingdom the same mode of procedure obtains, they may be bracketed together in the one description. Up till some years ago there was no public prosecutor in England. Then, however, an Act was passed authorising the appointment of such an official, who should undertake this duty in certain specific cases of public importance, and in such districts as the appointment might be agreed upon. In ordinary circumstances it is left to the person against whom the crime has been committed to himself prosecute the offender. Assuming that he has resolved to do this, the procedure thereafter is as follows: The witnesses in the case, before a magistrate, a justice of the peace, or a body of justices, and in presence of the accused, make their depositions, which are taken down in writing, and after having been read over to them are severally signed by them and by the presiding justice. From the *primâ facie* evidence given, it remains for the justice to decide whether or not the accused shall be committed for trial, because, in serious cases, it is not his duty to say whether the accused person is guilty. If the prisoner be committed for trial, he is either kept in prison—if the crime be one for which bail may not be accepted, such as murder or treason—or, otherwise, he may be liberated on sureties given by himself, or by friends, or by both. His case next comes before the grand jury—a body of gentlemen numbering not fewer than twelve, and not more than twenty-three—at the next assizes or term. The mode of procedure before the grand jury is to call witnesses to support the charge against the prisoner, and if a majority of jurors numbering at least twelve conclude that there is a *primâ facie* case against the accused, they "find a true bill," which then becomes the indictment; if, however, a majority think that the evidence which has been led is inadequate to support the charge, they "throw out the bill." In this preliminary investigation—because it is not a trial in

respect that the accused is not called upon to plead—the sole object is to prevent a trumpery case being brought forward and to determine whether or not there is sufficient evidence to warrant the trial. If a "true bill" be returned against a prisoner, he stands committed for trial before the petty or ordinary jury, when he is brought before the court and is required to plead to the indictment against him; the presiding judge of the court sitting by virtue of a five-fold commission, viz.: (1) of Oyer et Terminer; (2) Gaol-Delivery; (3) Nisi Prius; (4) of the Peace; and (5) of Assize. The procedure at the trial is as follows: The prisoner having pled "not guilty," and the jury being sworn, the prosecuting counsel opens the case against the prisoner by stating the facts to which the witnesses he is about to call will testify. He next calls and examines his witnesses in turn. This examination of a witness is called the examination-in-chief. Each witness, at the conclusion of this examination, may be cross-examined by the counsel for the accused, or by the accused himself if not represented by counsel, after which the prosecuting counsel may re-examine each witness on points brought out in cross-examination, but he may not examine the witness on any fresh subject of evidence not previously brought out; after which, if the witness is to be asked any further questions, such must be put through the judge. After these witnesses have been called, counsel for the prosecution is informed by the counsel for the accused whether or not he intends to call witnesses. If he proposes to do so, then the position of counsel with reference to examination of defendant's witnesses is reversed. At the conclusion of the evidence, defending counsel addresses the jury on behalf of the prisoner, thereafter the prosecuting counsel addresses the jury, and last of all the judge sums up, and the jury are left to return their verdict. If, however, defending counsel does not propose to call witnesses, the order of procedure is changed to this extent, viz., that at the end of the evidence for the prosecution, prosecuting counsel proceeds to address the jury, after him the defending counsel, and then follows the summing-up of the judge. If the prisoner be not defended by counsel, the right of addressing the jury possessed by the prosecuting counsel under other circumstances, is denied him.

The other court in England, in which medical evidence is largely required, is the Coroner's Court or Inquest. Legally speaking this is not a trial, for as at the magistrate's inquiry the prisoner or accused, if such there be, cannot be called upon to plead. It is, therefore, essentially an inquiry or inquest. A want of knowledge of the powers of the coroner and the limitations of his office on the part of medical men continually gives rise to much heart-burning. Coroners are of three kinds, viz.: (1) Those by virtue of office; (2) those by virtue of charter, commission, or statute; and (3) those by election. The Lord Chief Justice of the Court of King's Bench is the chief coroner of England, the other judges of that court being sovereign coroners by right of office. Under the second head are the coroner appointed by the Dean and Chapter of Westminster for the city of Westminster, and the coroner of the King's Household. These hold office by virtue of charter. By the Municipal Corporation Reform Act (5 & 6 Will. IV. c. 76) sec. 62: it was enacted that after May 1, 1836, the council of every borough in which a separate court

In 1835
In and later by the Municipal Corporation Act, 1882

of quarter sessions shall be holden, was to elect a coroner for such borough, who should hold office so long as he shall "well behave himself in his office," and who, when so elected, was not to be a corporate officer. These hold office under statute. County coroners are elected under the statute 3 Edw. I. c. 10, which enacts that "through all shires sufficient men shall be chosen to be coroners of the most legal and most wise knights." The number of coroners in individual counties varies, as it is not limited by statute. The election of a county coroner proceeds under the writ *De coronatore eligendo* directed to the sheriff, whose acts are regulated by the Act 7 & 8 Vict. c. 92. A coroner so elected does not demit office on the demise of the monarch. Freeholders of the county are the electors. By the Act 14 Edw. III. c. 8, the holder of the office was required to have sufficient land in fee in the county to answer all people. It is, however, sufficient that the person appointed should possess land sufficient for the degree of a knight, which is to the amount of twenty pounds per annum. By the Act 6 & 7 Will. IV. c. 105, sec. 6, every borough coroner, and by the Act 6 & 7 Vict. c. 83, every county coroner, shall appoint a competent person to act as his deputy in office. The duties of the office of coroner may be summed up as follows: (1) To hold inquests on the bodies of persons who die by violence, accidental or otherwise, on the bodies of those who die suddenly under suspicious circumstances, or of those who die in prison; (2) to prepare and make a return annually of the inquests he holds; (3) to apprehend persons charged with murder or manslaughter, and to bind over for further attendance at the assizes, prosecutors and witnesses; (4) to attend the trial of prisoners charged under inquisitions held by him; and (5) various other duties in which, however, medical men ordinarily have no interest. In these days, in view of the movement toward filling the offices of coroners by medical men, it is essential that aspirants to the office should be fully acquainted with the statutory enactments and duties attaching thereto.

In holding an inquest upon a body, the duties of the coroner are defined by the Act 4 Edw. I. c. 2, *De Officio Coronatoris*. According to this statute the coroner and jurors must "view" the body and the nature of the injuries by which the death has been caused, and, if necessary, the body must be exhumed for this purpose. By the Coroners Act, 1887, sec. iii., his duty is so defined :—[1]

"Where a coroner is informed that the dead body of a person is lying within his jurisdiction, and there is reasonable cause to suspect that such person has died either a violent or unnatural death, or has died a sudden death of which the cause is unknown, or that such person has died in prison, or in such place or under such circumstances as to require an inquest in pursuance of any Act, the coroner, whether the cause of death arose within his jurisdiction or not, shall, as soon as practicable, issue his warrant for summoning not less than twelve, nor more than twenty-three good and lawful men to appear before him at a specified time and place, there to inquire as jurors touching the death of such person as aforesaid."

After the "view" the coroner is to inquire as to the cause of

[1] Coroners (Consolidation) Act, 50 & 51 Vict. c. 71.

death, and to effect this is empowered to summon such witnesses as may be able to aid him toward that end. It is within the option of the coroner not to summon a jury or hold an inquest where the evidence as to the cause of death in any given case is otherwise sufficient.

Relation of Medical Men to Coroner and Inquest.—There are certain questions which affect the medical profession with respect to their relation to the coroner's office. Of these, probably the most important is that with respect to whether it is the duty of a medical practitioner in attendance upon a person who has died from a violent or any unnatural cause to report the fact to the coroner. It does not appear that there is any statutory obligation upon a medical man, as such, to do this; but it is a question whether at common law, he, as a member of the community, ought not to perform this duty. In view, however, of the strong statements of Chief-Justice Hawkins in Kitson *v.* Playfair, with respect to professional secrecy, and also of the undesirability of the medical profession, without compulsory requirement, acting in any manner which would seem to desecrate the confidential relationships which obtain between medical men and their patients, it is advisable that such information should not be conveyed, unless explicitly through the terms of a medical certificate of death, which such a practitioner may give in accordance with the terms of the Registration of Births and Deaths Act, 1874, sec. xxxix., or implicitly by withholding such certificate of death, which, under reasonable excuse, he is entitled to do, in which case the death would come under the cognisance of the coroner as an uncertified death, and thus would enable that official to exercise his office; in any case, until legislation compels the members of the medical profession to send such information direct to the coroner, or a High Court gives such interpretation to the common law upon a stated case as will vindicate their action and thus protect them, it is better to proceed as has been indicated. Again, with reference to the "view" of the jury which the law presently compels, it may be considered whether such is not now an anachronism. The view was instituted when there were no medical witnesses summoned and no post-mortem examinations were performed, and it may reasonably be urged that such a view will have but little significance, if, indeed, it be not in the main repugnant to the minds of ordinary lay jurors. There are no good grounds to be stated against an inspection by the coroner himself, who ought to be able to do this intelligently—particularly if a medical man—as an important part of his qualifications for the office, and, especially, as he is, for the time being, the legal possessor and custodian of the body. However, so long as the view by the jurors is part of the law, this duty must be fulfilled.

Apart from the purely criminal aspect of the office of coroner, it is probably true that the bulk of his labour consists in reporting upon the causes of death of persons regarding which no medical certificate has been granted, or, even where such a certificate is produced, where there are *primâ facie* grounds presuming criminal responsibility. There can be little doubt that the operation of his office is calculated to produce, as it has in the past effected, considerable reduction in the number of "uncertified" deaths in England as compared with Scotland.

The relation of the coroner to medical witnesses being of such importance, some attention to this is necessary. In summoning witnesses, the coroner may by virtue of statute 6 & 7 Will. IV. c. 89, sec. 1, summon medical witnesses, and, if necessary, may direct such medical witnesses to perform a necropsy and to make a chemical analysis of the contents of the stomach. This summons the medical witness is bound to obey, otherwise he is liable to a penalty. The following is the scheduled form of summons :—

"London *to wit* *To* Esq., Surgeon.

"Sir,—By Virtue of this my Order as one of His Majesty's Coroners for the *County of London* you are hereby required to be and appear before me and the jury on day, the day of at o'clock in the noon, at in the Parish of then and there to give evidence on His Majesty's behalf touching the death of , and to make or assist in making a post-mortem examination of the Viscera of the Head, Chest, and Abdomen of the body of the said with an analysis and report thereon at the said Inquest. And herein fail not at your peril.

"Dated the day of 190 ."
(Signature of Coroner.)

If the summons be not framed in these terms, it is simply an ordinary summons for which no expert fee can be demanded, but for neglect of which the same penalty of £5 carries.

With certain exceptions, attendance after summons at an inquest, according to the Act quoted, entitles the medical witness to a fee of £1, 1s., and if a post-mortem examination be made by direction of the coroner, with or without an analysis of the viscera, to a fee of £2, 2s. The exceptions to this rule are defined in the Coroners Act, 1887, sec. 22, as follows :—

"Where an inquest is held on the body of a person who has died in a county or other lunatic asylum, or in a public hospital, infirmary, or other medical institution, or in a building or place belonging thereto, or used for the reception of the patients thereof, whether the same be supported by endowments or by voluntary subscriptions, the medical officer whose duty it may have been to attend the deceased person as a medical officer of such institution as aforesaid, shall not be entitled to such fee or remuneration."

This provision is in consonance with section 5 of 6 & 7 Will. IV. c. 89, except that it has been broadened by the words used—"or other medical institution," for the words "or other public medical institution" of the older statute. This provision is held to be a hardship upon those medical men who hold the office of medical officer to cottage hospitals, or infirmaries attached to public schools, training colleges, and the like. The case of Horner *v.* Lewis (67 L. J. 524) in which the honorary medical officer of a cottage hospital sued the coroner for his fee for a post-mortem examination of the body of an inmate, was lost by the plaintiff because Justices Wright and Kennedy ruled

that the hospital was a public institution. The same disability to claim fees falls upon army medical officers for attendance at inquests upon the bodies of persons who have died in military hospitals.

When a coroner and his jury have concluded the hearing of evidence, it becomes the duty of the latter to return a verdict in accordance with the evidence. Where the duties are performed intelligently, such verdicts may, in the main, be considered satisfactory; on the other hand, occasional verdicts may be not only unsatisfactory, but may truly be called amazing. Before the Committee of the House of Commons on Death Certification, Dr. Ogle[1] stated that one verdict came before him in his official capacity that was of the latter character. It was this: "A man died from stone in the kidney, which stone he swallowed when lying on a gravel path in a state of drunkenness." He further added that he thought that some joke had been played, but, that having written to inquire about it, he found it to be an absolute fact. Another verdict, he stated, was as follows: "Child, three months old, found dead, but no evidence whether born alive." It would be difficult to conceive the mental qualifications for such a duty of those who returned such verdicts.

In any case where a medical witness has given evidence in which an accused person is committed for trial, he, in common with other witnesses, is bound over to give evidence at the assizes or other court at which the trial is to take place. Accordingly, he is summoned to do this in terms of the following summons:—

"Edward, by the Grace of God, of the United Kingdom of Great Britain and Ireland, King, Defender of the Faith, To
Greeting: We command you, and every of you, that all business being laid aside, and all excuses ceasing, you do in your proper persons appear before our Court of Quarter Sessions of the Peace [or other Court], assigned to keep the peace in the City [or Borough] of , and also to hear and determine divers Felonies, Trespasses and other Misdemeanours in our said City [or Borough] committed, to be holden within the , in the said City [or Borough], on the day of now next ensuing, at the Hour of Ten of the Clock in the Forenoon, of the same Day, to testify the truth and give evidence, on our behalf, against in a case of ; and this you and every of you are in no wise to omit, under the Penalty of twenty pounds for you and every of you. Witness, Esq., our Recorder at aforesaid, the day of in the year of our reign.

L. S.

(Signed)

"Clerk of the Peace."

As difficulty is experienced by young practitioners in obtaining information regarding the fees to which they are entitled for services performed to the State, the following statement of statutory fees may prove of service:—

If the police call a medical practitioner to perform professional

[1] Report of Committee, p. 8.

services to any one between the hours of 8 A.M. and 10 P.M., he can claim a fee of 3s. 6d., and between the hours of 10 P.M. and 8 A.M. of 7s. 6d. To entitle him to receive the fee the practitioner must obtain a certificate of such attendance from the police inspector on duty.

The fees in police courts are as follows :—

First.—Where the accused is committed for trial, the magistrate certifies to the clerk of arraigns that a fee is due for each day of attendance, viz. 10s. 6d. if witness live within two miles of the court, and £1, 1s. if beyond two miles.

Second.—Should the prisoner not be committed for trial, the witness should ask the magistrate for a certificate of attendance, which will entitle him to payment on the above scale.

Provision for such payments in magistrates' courts is made by the Criminal Law Prosecution Expenses Act (29 & 30 Vict. c. 52, sec. 2), which provides that where magistrates sign such certificates, and where such are sent to the clerk of the peace to be laid before courts of quarter sessions, the expenses may be allowed in whole or in part, according to the scale fixed under sec. 5 of the 14 & 15 Vict., and the Court may issue orders for the payment thereof.

The attendance of medical witnesses before courts of summary jurisdiction is affected by the Indictable Offences Act, 1848, sec. 16, by which a justice has the power to compel by subpœna the attendance of any person whose evidence is material in the case, and while there is nothing enacted therein with regard to tender of expenses, and the medical witness, therefore, ought to obey irrespective of such a tender, it would seem from the opinion expressed by Mr. Justice Hawkins (R. *v.* Osmond, *Times*, Sept. 6, 1893), that solicitors have no right to bring a witness a long way upon subpœna without such a tender of expenses. By the Summary Jurisdiction Act, 1848, sec. 7, a justice is empowered to compel the attendance of an unwilling witness on proof put before him that, despite the tender of expenses, the witness has refused to come. It would appear, however, that such expenses would not include moneys for loss of time, but for outlays consequent only upon the attendance.

Before Courts of Quarter Sessions and the Central Criminal Court of London, witnesses may be subpœnaed in criminal cases without tender; but should a witness be summoned from another part of the kingdom in terms of 45 Geo. III. c. 92, sec. 3, a sufficient tender must be made to defray his expenses. Apart from such a case as the latter, the State is under no legal obligation to pay fees to witnesses; but the Secretary of State, under the powers of 14 & 15 Vict. c. 55, has ordered for medical witnesses the following scale of remuneration, viz.: for each day of attendance £1, 1s., and for each night 2s.; and if attendance is from a distance, travelling expenses, 3d. per mile each way. It is very advisable that witnesses should obtain their fees at the conclusion of the case for which they have been subpœnaed, to save further trouble.

By the County Courts Act, sec. 111, it has been decided that a witness, even after having been sworn, may decline to give evidence until his expenses have been paid. (In *re* Working Men's Mutual Societies (1882), 21 Ch. D. 831.)

Attendance by a medical witness before the High Court of Justice or the Assizes cannot be made compulsory, in terms of 17 & 18 Vict. c. 34, until a tender of expenses has been made. The following is the part of the Act on this subject: "None of the said courts shall proceed against any person for making default by not appearing to give evidence unless it shall appear that a reasonable and sufficient sum of money to defray the expense of coming and going was tendered to the witness." Such expenses ought to include cost of travel and of residence while in attendance on the case. Again, it has been decided in the case of Allen *v.* Yoxall (1844, 1 C. and K. 316), that a witness subpœnaed by both plaintiff and respondent is entitled to expenses from both, even though only called by one to give evidence.

The fees in County Courts are regulated by scale for ordinary and for expert and scientific witnesses; as ordinary witness, for time, 15s., and for hotel expenses, if from home, £1, 1s. per day; as expert and scientific witness, for qualifying to give evidence, time, £1, 1s. to £3, 3s., and expenses £1, 1s. to £5, 5s. per day, and for attendance at court, time, £1, 1s. to £2, 2s., and expenses, £1, 1s. to £3, 3s. per day. In Admiralty Courts, and where the medical witness lives within a distance of five miles, for time £1, 1s. to £3, 3s., and if a greater distance, £1, 1s. to £3, 3s., not inclusive of travelling expenses. In the Court of King's Bench and Chancery Divisions, if the witness be resident in the town where the cause is tried, £1, 1s. per day, if at a distance £2, 2s. for time, and £3, 3s. for expenses per day, not inclusive of travelling expenses. In the House of Lords, the medical witness receives, for time, £2, 2s., for expenses £1, 1s. per day, exclusive of travelling expenses, which in no case "shall exceed 1s. per mile one way."

Little need be said on the subject of expert evidence called in civil actions, as the fees are usually arranged after the witness has decided that he can appear and give evidence. Should, however, such fees afterwards be disputed, it is well to bear in mind that "just and reasonable charges and expenses as appear to have been properly incurred in procuring evidence and the attendance of witnesses" allowed by Order 65, r. 27 (9) of the Rules of the Supreme Court, has been interpreted to mean in the case of an expert witness £7, 7s. per day for reading up a case in order to give evidence.

II. In Scotland.—The prominent characteristic of criminal procedure in Scotland is the existence of the office of public prosecutor.

The Lord-Advocate is the chief public prosecutor; then, in a descending scale, advocates-depute, and procurators-fiscal.

The duty of bringing all accused persons to a bar of justice, and at the public expense, falls primarily upon the public prosecutor. In addition, he is charged with the duty of inquiring into the cause of sudden or suspicious deaths, which inquiry takes the form of precognition of witnesses—lay and medical. After he has performed this duty he is further charged under the Registration Act (17 & 18 Vict. c. 80, sec. 40), to report and certify the cause of death to the registrar of the district in which the death took place. His duties, therefore, include the sphere of action of the coroner in England. In

carrying out the criminal part of his office, his instructions are, when serious cases of crime are reported to him, to proceed to the *locus* with the sheriff and make an examination for himself; in such cases as rape, child-murder, or concealment of pregnancy, where invaluable evidence of the commission of the crime may be lost by delay, he is expected to secure early medical examination of the assaulted person and of the accused; where death results from violence, to see that a post-mortem examination is made by medical men of skill, who shall, as soon thereafter as possible, furnish him with a report of the said examination, and of their opinion as to the cause of the death; in the event of a serious assault to the extent of danger to life, and where death after an interval takes place, he is expected to obtain accurate evidence respecting the treatment of the injured person during the said interval; and to be prepared when called upon, in the event of assaults of the above kind likely to prove mortal, to proceed with a magistrate and take the deposition of the dying person upon oath, which deposition should be signed when possible by the said person and the magistrate in attendance; or he may instruct the medical attendants of the injured person how to proceed in this direction in the event of such a sudden change occurring in the condition of the person as would not permit of time for the legal authorities to be summoned. It may be said, too, that inquiry into the cause of sudden deaths is also prompted from the point of view of crime, since it is the suspicion of culpability which initiates his action. In such cases, in deaths from accident, and in all cases of sudden deaths reported to him by the police, or otherwise, he shall precognosce witnesses, among whom a medical witness shall be one, and from whom he shall have asked and received a proper medical report as to the cause of death, without a post-mortem examination where the cause of death can be ascertained without it, otherwise after a post-mortem examination.

As a medical witness may require to appear in any of the criminal law-courts, the following indicates the names of these courts, and, to some extent, the class of cases which are tried therein:—

I. Burgh Police Courts: for trifling offences, or as the court of first instance, in remands to a higher court.

II. Justices' Court, in Counties: for like offences.

III. Sheriff Court: in which the sheriff of the county, or his substitute, may act by himself, or with a jury—for crimes of a more severe character than the two former, and graded in severity in respect of a jury acting along with the sheriff.

IV. The Circuit Court: which meets quarterly or oftener in certain populous towns, and which deals with major and other serious crimes, and in which after conviction, in a charge of murder, a sentence of death may be pronounced.

V. The High Court of Justiciary: which sits in Edinburgh, and which is the highest criminal court in Scotland.

In order to better follow the procedure, let it be assumed that a crime is alleged to have been committed which involves the need of medical testimony—say, murder, or rape, or concealment of pregnancy; and what follows will be generally the procedure.

The police lay information of the crime before the procurator-fiscal—the prisoner meanwhile either being still at large, or having been apprehended—and provide him with a list of the witnesses in the case. The prisoner on apprehension is first of all brought before a police magistrate on the given charge, by whom, however, he is remanded to the sheriff. The fiscal then proceeds to precognosce the witnesses, having also made arrangements for the making of a necropsy, if a case of murder or culpable homicide, or an examination of the body of the living person, if obtainable, in the case of rape, or concealment of pregnancy, by medical men, who shall report to him in due course. The sheriff or his substitute gives the prisoner an opportunity—in the presence of his law agent if such have been employed—of emitting a Declaration anent the charge preferred against him, after the prisoner has been duly warned that he may not, if he like, say anything, but that if he choose to do so the same shall be written down, and used at his trial.

By this time the fiscal has finished his inquiry; the precognitions of witnesses have been taken, the medical reports are in his possession, and these together are forwarded to the crown agent, by whom they are placed before one of the advocates-depute, who, after review of the documents, makes an order on one or other of the following lines, viz.: (1) that no further inquiry is necessary; (2) to continue the inquiry; (3) to prosecute in the manner suitable to the circumstances of the crime. Depending upon the nature and gravity of the crime, where a prosecution is determined upon, the order may be "Sheriff summarily"—which involves, upon conviction after trial, a maximum sentence of sixty days' imprisonment; or "Sheriff and Jury," which extends the limit of possible sentence to two years' imprisonment; or "Indict," which indicates trial before the Circuit Court or the High Court of Justiciary. Let it be assumed that the last is the form of direction; then a "diligence" under the hand of the clerk of justiciary is sent to the crown agent, who, in his turn, causes it to be forwarded to a macer of the High Court of Justiciary. This diligence authorises that official to summon the accused to appear to meet the charge against him before the court, and also to summon the witnesses whose names have been supplied to him. Having fulfilled his duty, the macer returns to the crown agent a certified copy of the names of the witnesses summoned. The indictment is carefully drawn as to its terms, in respect of the character of the crime, the place and time of perpetration, the "productions" (that is, garments, weapons, or documents) in the case which are to be used as evidence against the accused being detailed, and to it is also added a list of the witnesses summoned to give evidence. Up to the year 1887 the drawing of an indictment was a ponderous affair, but by the 50 & 51 Vict. c. 35, sec. 2, it has been, with advantage to all concerned, much simplified. Now, it substantially consists of the following parts, viz.:—

I. (*a*) Designation of accused; (*b*) designation of prosecutor; (*c*) the charge, which condescends upon (1) time, (2) place, (3) and manner; (*d*) aggravations.

II. List of productions.

III. List of witnesses.

All three sections are signed by the prosecutor.

Of the productions it must be said that they usually bear labels when produced in court, upon which witnesses have, after identification of the article on a previous occasion, signed their names; therefore all that the witness has to do to identify the article while giving his evidence is to look for his signature on the label.

The indictment is, therefore, the accusation which is served upon the accused when he is to be tried, and along with it must be served a notice calling upon him to appear and answer thereto.

The precognitions and reports in the case form the "brief" of the advocate-depute or the procurator-fiscal, who acts as prosecuting counsel at the trial of the accused, from which he leads evidence of the witnesses.

From what has been said it will be apparent that procedure in Scotland differs substantially from that of England. But there are additional differences. An English jury is composed of twelve men, a Scottish jury of fifteen. The former may fail to return a verdict, or, if a verdict be returned, it may be one of two only, viz.—Guilty or Not Guilty; the latter may return one of three verdicts, viz.—Guilty, Not Guilty, or Not Proven; the former can only convict or absolve when unanimous, the latter may by a majority.

In England, juries are those of the grand jury, of the petty jury, and of the coroner's inquest. In the first the number may not be less than twelve nor more than twenty-three; in the second not more than twelve, and in the last as in the grand jury. In Scotland, an ordinary jury, no matter in which court, criminal or civil, the jury may be called upon to act, numbers fifteen, with the exception of that which sits with a sheriff as a public inquiry in regard to fatal accidents occurring in industrial employments or occupations, by virtue of the Fatal Accidents Inquiry (Scotland) Act, 1895 (58 & 59 Vict. c. 36, sec. 4, sub-sec. 5), when it is composed of five common and two special jurors—seven in all.

The following are the forms of summons to appear before the High Court of Justiciary, and at an Inquiry into a fatal accident:—

(1)

"*To*

"You are hereby lawfully cited to attend a Sitting of the High Court of Justiciary within the Criminal Court , upon the day of Nineteen hundred years, at o'clock noon, as a Witness in the case against , Prisoner in the Prison of , and that under the pain of One Hundred Merks Scots.

"(Signed) ,
"Sheriff-officer."

"NOTE.—Any Witness failing to appear in terms of Citation not only forfeits the penalty, but is liable to be apprehended and imprisoned.

"(Preserve and bring this Copy with you)."

(2) "*Under the 'Fatal Accidents Inquiry (Scotland) Act*, 1895.'

"*To* .

"You are hereby lawfully cited at the instance of the Procurator-Fiscal to attend and give evidence as to the death of , at a Public Inquiry under the provisions of the above-mentioned Act, to be held within the Criminal Court House of upon the day of 190 , at o'clock forenoon, and that under the pain of One Hundred Merks Scots.

"(Signed) , Sheriff-officer."

Warning of penalty on failure to answer is appended in identical terms to those of the previous summons.

The fee for attendance at court of a medical witness is £1, 1s. per day; for a post-mortem examination and report, £2, 2s.; for an analysis of blood or other stains on clothing, £2, 2s. to £4, 4s. depending upon amount of work to be done. Should the witness travel a distance to obey the summons, he receives first-class return fare by railway.

Under the Workmen's Compensation Act, 1897 (60 & 61 Vict. c. 37), practitioners are appointed, by the Secretary of State for the Home Department in England, and by the Secretary for Scotland, in Scotland, in each sheriffdom, for the purpose of acting as medical referees in cases of accidents to workmen out of which actions for compensation may arise. The medical referee appointed may be consulted by any workman who declines to be examined by the medical man engaged by the employer, or insurance company as indemnifier of the employer, either on the ground of initial objection or of dissatisfaction, in which case the workman himself shall pay the medical referee. But a reference may be made to the medical referee on the part of the court, and in such a case the medical referee shall not accept the reference unless signed by the magistrate or his clerk, in England, or by the sheriff or his clerk, in Scotland. A scale of fees is appended to the Act as the remuneration of said medical referees, as follows:—

(1) For a first reference, which includes examination of the injured workman, and a written report thereof	£2	2	0
(2) For a further statement, which includes matter not covered in original reference . .	1	1	0
(3) For a second, or any subsequent reference to the same referee in a further arbitration, in the same case, including an examination and report	1	1	0
(4) Where the medical referee attends the arbitration at the request of the sheriff; for attendance	3	3	0
(5) For travelling a distance beyond two miles in order to examine the injured workman, the medical referee is entitled, for each mile beyond the said two miles, to a fee of	0	5	0

The medical referee shall be paid the above fees quarterly, on presentation of a statement in the form prescribed in the schedule of the Act, to the Home Office, or the Scottish Office, as the case may be.

CHAPTER II.

MEDICAL EVIDENCE.

MEDICAL evidence resolves itself into three forms, viz. :—

(*A*) Documentary.
(*B*) Parole, Oral, or *Viva Voce.*
(*C*) Experimental.

The last two forms, however, must eventually be deponed to on oath in the witness-box; and, therefore, the classification is more academic than practical.

In respect that a medical witness is more likely in his first connection with a case to be called upon to present a report of some kind, we shall discuss the various forms of documentary evidence which may be presented to a court of law.

(*A*) **Documentary Evidence.**—This may take the following forms, viz. :—

(1) The Medical Certificate.
(2) The Medical Report.
(3) Notes or Memoranda.
(4) Dying Declarations.

I. The Medical Certificate is the simplest form of documentary evidence, and may consist in the certification by a duly qualified and registered practitioner of the inability of attendance in court of a witness or juror, by reason of illness. In England no particular form of words is required. A simple statement of facts, embodying the name, address, designation, and nature of the illness of the witness or juror, signed by a practitioner, qualified as above, is all that is necessary. It ought to be remembered that the mere possession of a qualification to practise is not enough, for the possessor is not legally competent to sign certificates until his name is on the Medical Register of the General Medical Council, production of which is legal evidence of his status of qualified practitioner. In Scotland, on the other hand, something more is necessary to constitute the certificate legal. The statement of facts must be attested "on soul and conscience"; without these words, no certificate in a Scottish court is legal, and their absence from a certificate renders the witness or juror liable to be amerced in the fine of one hundred merks Scots; indeed we have seen such happen. Certificates of death do not require such form of attestation, as they are in accord with the form scheduled in the Registration Act.

II. The Medical Report.—This form of evidence is given at the instance of the procurator-fiscal by a medical witness in circumstances such as the following :—

(*a*) In a case where injuries have been inflicted upon an assaulted person by a prisoner, or accused person.

(*b*) As the result of post-mortem examination of the body of a person who has died suddenly, or under suspicious circumstances, or from culpable violence, or from any other form of violent death, such as poisoning.

(*c*) For the purposes of the Fatal Accidents Inquiry (Scotland) Act.

(*d*) For the purposes of an inquest regarding the death of a person while in prison, under the Prisons (Scotland) Act, 1877.

(*e*) As the result of the examination of a body after exhumation.

(*f*) As reports as to stains upon clothing.

(*g*) As reports of analysis in cases of poisoning.

All such documents must, in Scotland, be signed "on soul and conscience."

In the first class of cases, all that is required in the report is a narration of the character, number, situation, dimensions, and kind of lesions found upon the person—using accuracy in every particular—and a statement of opinion of the class of weapon which has been used in their production.

In the other cases, where a post-mortem examination of a body is required, procedure differs in England and Scotland. In England the summons of the coroner to perform a necropsy is the warrant for performing it. In Scotland the procedure is so different that some detailed consideration is necessary.

In every case in which there is reason to believe that a person has died from violence at the hands of another, or from any culpable act, or omission, the procurator-fiscal must see that a post-mortem examination of the body is made, in order to ascertain the exact cause of death. Accordingly that official presents a petition to the sheriff, as follows:—

"GLASGOW, . , 190 .

"Unto the Honourable the

SHERIFF OF THE COUNTY OF LANARK.

"The Petition of , Writer in Glasgow, Procurator-Fiscal of Court for the Public Interest,

"*Humbly Sheweth,*

"That from information received by the Petitioner it appears that died at or in on the day of under circumstances calling for investigation.

"That a precognition in the premises and a post-mortem examination of the body of deceased seem necessary:

"May it therefore please your Lordship to grant Warrant to cite witnesses for precognition in the premises, and to remit to Drs. , to make a post-mortem examination of deceased's body, and to report as to the cause or probable cause of death. According to Justice.

"(Signed)

"Procurator-Fiscal."

" 190 . Having considered the foregoing Petition, Grants Warrant and remits all as craved.

"(Signed) , Sheriff."

The above warrant is forwarded to the medical man or men named in it, with an intimation where the body is lying, and it enables him or them to make the necessary examination without contravention of the Anatomy Act, which prevents dissection being made in places other than those licensed for the purpose. Armed with the warrant, he or they proceed to the place where the body is lying, where they are met by a sheriff-officer who has the witnesses in attendance to identify the body. It is absolutely necessary where death has been due to culpable violence by an assailant, that two medical men should be named in the warrant, that both together should perform the examination, and that both, if agreed, should sign the report; or, if failing to agree, that each should send a separate report.

Before beginning the examination of the body, the first duty of the medical examiners is to secure identification of the body in the legal sense—for this identification it is not necessary that the name of the deceased be known—by at least two competent witnesses, whose names, designations, and addresses must be fully noted by the examiners. Thereafter, and before the necropsy is begun, the room is cleared of all persons save the examiners.

The latest pronouncement of the Lord Advocate on this point is as follows (May 1899): "No person except the medical men instructed to conduct the necropsy is allowed to be present at a post-mortem examination except with consent of crown counsel or on order of the sheriff. Crown counsel may, in their discretion, sanction the presence of a medical man who has attended the case or in the interests of the accused, but this is done only on condition that he is to be present merely as an onlooker, and is not to interfere in any way with the crown examination. No formal intimation is given that the necropsy is to be held, but in all cases where any person is in custody on suspicion of causing death a necropsy is made as a matter of course, so that an accused person or his advisers cannot be in doubt as to the necessity of making immediate application for permission to send a medical man to witness the necropsy if they so desire it. The quarter to which application should be made is the procurator-fiscal, whose duty it is in all cases of urgency to communicate by telegraph with the crown agent for the instructions of crown counsel. If an independent post-mortem examination is desired it can be made after the crown examination."

It will be found of much advantage that one examiner should do the manual work of examination and that the other take notes, after verification, of the facts observed, during the currency of the examination, which should be conducted in a systematic and methodic fashion. While different examiners may adopt different modes, the following, from long experience, has commended itself to ourselves.

External Examination.—The reporters should make a careful external examination of the body with reference to appearances (*a*) indicative of the time of death and the position in which the body has lain for some time after death; and (*b*) of marks of violence, or any other marks, from any cause whatever, pointing to the cause of death.

It will be obvious that, with respect to this part of the examina-

tion, the extent of the objects to be observed must depend in great measure upon the fact whether the body has or has not been identified in the individual sense. For example, if the body has been identified by the witnesses as that of A. B., it will be unnecessary for the examiners to give any attention to marks upon the body which would establish identity; but, on the other hand, if the body has only been identified for legal purposes as that of a given body to be examined, but without establishment of identity of the body as that of a named person, all appearances, normal and abnormal—such as (*a*) height, determined by measurement; (*b*) age, approximately arrived at by condition of bones, state of teeth, height, weight, and other factors; (*c*) sex; (*d*) colour of the eyes, and of the hair; (*e*) condition and number of teeth; (*f*) bodily deformities or abnormalities; (*g*) scars and tattoo marks (*vide* p. 67) — must be carefully noted, so that, if possible, identity may be established afterwards. In ordinary cases, even in such circumstances, the medical examiners need not extend their observations to the clothing, as that is the duty of the police, but it would fall within their duty to carefully note, for example, the wrappings in which the body of an apparently newly-born child was enveloped, or the clothing or wrappings of a body which has been discovered in an advanced state of decomposition, in some secret place, such as a trunk or bag. Clothing ought to be examined separately for stains, or for cuts, or perforations in cases of stabbing, shooting, &c.; and it is better that each examination should form the subject of a separate report.

Assuming the body to have been fully identified, the points to be attended to with respect to the *time* of death, are (*a*) the presence, and extent, or absence of *rigor mortis;* (*b*) the incidence, extent, and colour of post-mortem lividity; and (*c*) the presence, character, and extent of putrefaction. The value of these observations will be discussed later. With respect to the *cause* of death the following points among others of a like character ought to be noted, viz.: (*a*) all marks indicative of violence. All wounds and bruises are to be *accurately* measured as to their dimensions, their situation and character to be noted with respect to the class of weapon which has produced them, and in this connection, marks of scorching, engraining of skin with carbon particles, or of smoke, to be carefully noted in relation to the question of suicidal or homicidal infliction; (*b*) marks on the neck of ligature, or from any other constricting cause; (*c*) condition of the hands, or feet, with respect to weapons, or other objects grasped in hands, ligaturing, blood stains, or other markings; (*d*) marks of burning from fire, scalding fluids, or corrosives, their incidence, character, extent, and degree; (*e*) the condition of the natural orifices of the body so far as they can be examined externally; (*f*) external examination of the vertebral column, with respect to fracture or dislocation; (*g*) condition of the limbs, with reference to the same.

Where wounds are situated in the line of the usual incisions in such examinations, such incisions must be deviated to enable the wound or wounds to be examined in their entirety with respect to extent of penetration. Where bruises or other like markings are present, all of them, after measurement, ought to be incised, to verify

the presence of extravasated blood, as questions may arise in court regarding their possible confusion with post-mortem lividity.

Internal Examination.—The external examination being completed, the examiners next proceed to the internal examination. At the very outset it is all-important for the young practitioner to remember that in every case of post-mortem examination *all the organs of all the cavities of the body* must be carefully inspected, even although the apparent cause of death has been found in one of them, since evidence contributory to the cause of death may be found in one or more of the others. The importance of this cannot be too strongly insisted upon, as inadvertent omission of a complete examination will tend to invalidate the report, or even may tempt a witness, while closely pressed by cross-examining counsel, to make statements which a re-examination of the body will disprove, and thus, very properly, make him the victim of a charge of perjury. There can be no possible excuse for a man who certifies a death to be due to "Congestion of the Lungs," who has not taken the trouble, by opening the air-passages, to find the true cause, found by others later on re-examination of the body, viz., impaction of a foreign body in the larynx; nor for the man charged to make an examination of a body in terms of the coroner's warrant already quoted, who neglects to examine all the organs of the body, and states falsely that he has made a complete examination. Such a state of things unfortunately has been too common. In a comparatively recent case a medical man was asked to examine the body of a man for whose death two men were in custody on the charge of feloniously murdering the deceased. He stated that he found certain marks about the head and upper part of the body, but notwithstanding, he attributed death to "failure of the heart's action, due to shock." Owing to the unsatisfactory character of the evidence, a re-examination of the body was made by the witness and a colleague, and the former had to admit that in the first examination he had omitted to observe a dislocation of the first and second vertebræ with fracture of the odontoid process and rupture of the lateral ligaments. In another recent case which came under our personal observation, two medical men had made a post-mortem examination of the body of a woman who had died under very suspicious circumstances, but they had failed to recognise the odour of carbolic acid when they opened the stomach, and to perceive the marks of corrosion about the mouth. These cases indicate this lesson, viz., that every post-mortem examination for medico-legal purposes must be completely as well as carefully performed.

An incision in the middle line of the body from chin to pubes (avoiding the umbilicus) having been made, the examiners, in the usual methods of the post-mortem room, throw open the chest and abdomen. Division of opinion exists among experts as to whether, in such cases, the head should be first examined or the chest and abdomen. The argument in favour of the former course is that a better idea of the condition of the circulation of the meninges and brain is obtained, since, it is urged, the blood-vessels are apt to be drained more or less, if the large blood-vessels of the chest be severed in a previous examination of the chest organs. Whatever force there

may be in this argument, it may be overcome by opening the head after the organs of the chest have been exposed, and before they have been touched *in situ*, or, at least, before the heart itself has been touched, although the pericardium be opened. The examiner may, thereby, by palpation, form some opinion of the amount of blood contained in the respective cavities of the heart, and observe, alongside of this, the blood-condition of the brain-membranes and brain itself, after removal of the membranes. After removal and examination of the brain, the meninges ought to be stripped in their entirety from the bones so as to reveal the presence or absence of fractures of the base of skull. It is a good plan, thereafter, to open the windpipe with a view to observe its contents, if any, and its condition; next to proceed to the individual examination of each organ of the chest and then to a like examination of the abdominal organs. In cases where there are *à priori* grounds of suspicion of poisoning being the cause of death, careful attention ought to be paid to the condition of the mouth and the whole intestinal tract. In such cases it is undoubtedly the best practice to remove the whole of the parts of this tract, viz., by the usual incisions along the inner side of the lower jaw, and by further dissection to free the whole of the soft parts of the mouth and œsophagus, prior to removal of which the lower end of the œsophagus, about three inches above the cardiac orifice of the stomach, should be tied in a double ligature, then separated between the ligatures, and the parts so removed placed in a clean glass jar, duly marked and noted; then by a double ligature at the pyloric orifice of the stomach, to remove that organ with its contents and place them in a second jar; then, next, the whole of the large and the small intestine, into a third jar; and, in further jars, the liver, the kidneys, the spleen, and the urine. All of which jars must be carefully covered and sealed and kept in a lockfast place by one of the examiners until they have been formally handed over, after receipt given and the labels have been signed, to an officer who has been charged to convey them to an analyst. The necessity of taking all the important parts of a body in a case of poisoning will be obvious when it is explained that after analysis by the crown experts, the remainder may be requested by the accused for examination by experts nominated by him for his defence. After the thoracic and abdominal cavities have thus been cleared, it will be a simple matter to inspect the anterior surfaces of the spinal column and the inner surfaces of the ribs with reference to their condition.

If any doubt be entertained as to the integrity of the spinal column, after examination by the finger in the foramen magnum and as indicated above, the bodies of the vertebræ should be cut open by V-shaped incisions with a saw so that the cord be fully exposed.

The examiners are entitled to remove such parts of the body as they may deem essential for further use; when preservation of such removed parts is thought advisable, alcohol alone should be used.

In every case of fatal wounding, especially where the wound is a penetrating one, great care must be exercised not only in the measurement of its dimensions, but in truly tracking its direction, as throwing probable light upon the relative positions of assailant and assaulted

at the time when the deed was committed. Where blood has been effused into a cavity of the body actual measurement of its quantity should be made.

From the result of the post-mortem examination is the report of the examiners framed, in regard to which certain important matters must be borne in mind by the reporters.

First.—The notes made during the currency of the examination should be looked over by the examiners prior to the body being sewn up, lest, perchance, any point has been overlooked, and so that omissions may be supplied.

Second.—The opinion expressed by the examiners in their report must be founded solely on the facts comprehended within the report, and not upon facts which are not specified in detail in the description of the organs as found.

Third.—That the examiners must deliver to the law authorities, within two days after the examination, their report of the examination, with their opinion of the cause of death, and the reasons for their opinion, which ought succinctly but clearly to be stated therein.

In addition to the foregoing, it may be said that the examiners should aim, above all, to couch the language of the report in the simplest but clearest terms, keeping in mind that it may afterwards have to be read in open court for the information of the court, counsel, and jury. Moreover, the report ought to be as brief as possible, compatible with clearness. It is not necessary to describe each organ in detail; it is enough to say, where the organs of a cavity have been found healthy, after examination, "that all the organs of this cavity were examined, and were found healthy." Should one or more organs only be found diseased or injured, after description of the facts found with respect to these, then it is better to say that "the other organs of this cavity were examined and were found healthy," than to describe their normal appearances. While in certain circumstances it may be impossible to avoid the use of technical words in a report, the examiners should try in popular language (within brackets) to give them popular interpretation. This conciseness, brevity, and clearness of language are of greatest value in the statement of the opinion, for, otherwise, the issues become confused, and the report will probably give rise to much unnecessary dubiety, and, perhaps, cross-examination.

Examiners should avoid the use of such terms as "about," or "nearly," when measurement is in question, or of comparative or superlative adjectives with respect, for example, to amounts of fluid or blood, when such can be exactly computed. In short, the whole report should be as exact as possible in its terms. Last of all, the examiners should keep the original notes as made at the examination, and a copy of the report as sent to the authorities, against the time of future possible use.

As the framing of the terms of the report is often a matter of difficulty to the beginner, the following will form a skeleton basis of report upon which any report may be founded :—

Form of Medical Report.

I. *Preamble*—

1. Date and place from which report is written.
2. The warrant for the examination, and by whom granted; and the place of examination.
3. The names, designations, and addresses in full of the witnesses who have, in the presence of the examiners, spoken to the identity of the body.

II. *External Examination*—

4. The external appearances on the body indicative of the time of death.
5. The presence or absence of external marks of violence; and if such are present, their site, character, dimensions, and relation to each other, and of any other markings which have a bearing upon the cause of death.

III. *Internal Examination*—

6. Description of result of examination of—
   (*a*) Brain, and its membranes; condition of bones of calvarium, and of base of skull;
   (*b*) Spinal column, and, if necessary, condition of spinal cord and its membranes.
7. Description of result of examination of organs, and contents of thoracic cavity—
   (*a*) General disposition of organs *in situ;*
   (*b*) Condition of pericardium, heart, and large blood-vessels;
   (*c*) Condition of lungs, larynx, trachea and gullet, and ribs, &c.
8. Description of result of examination of organs, and contents of abdominal cavity—
   (*a*) General disposition of organs *in situ;*
   (*b*) Condition of liver, spleen, kidneys, urinary bladder, stomach, pancreas, intestines; and, in a female, of the uterus and its appendages, and vaginal tract;
   (*c*) Examination of contents of stomach and urinary bladder;
   (*d*) Examination of internal aspect of intestines;
   (*e*) ,, ,, ,, uterus and ovaries;
   (*f*) ,, ,, abdominal blood-vessels.

IV. The reasoned opinion of the cause of death, based upon the foregoing facts found.

V. (In Scotland) The attestation of the foregoing "on soul and conscience."

VI. Signatures and medical qualifications of examiners.

Note.—(*a*) *In all reports, all numbers, except the date of the report should be put in writing, and not in figures.*

(*b*) *All interpolated words, or deleted words, ought to be initialled by the signators;* and at the end of the report, the number of words deleted should be stated, *and this statement should also be initialled by the signators.*

(*c*) *It is also advisable when the report occupies more than one page for the signatures of the examiners to be adhibited to each page.*

The following, but for the omission of the names, is one of many reports which we have had to present to the law authorities, and gives technical details which the foregoing does not show:—

"Place.
"Date.

"By virtue of a warrant of the Sheriff of , and at the instance of , Esquire, Procurator-Fiscal of the said County, we, the undersigned, on this date and within the mortuary of (*here name institution or police station*), made a post-mortem examination of the body of (*here fully name person, if known*), which was identified in our presence by the following persons, viz.:—

"1. A. B., son of the deceased, residing at 24 High Street;
"2. B. C., confectioner, of 261 Eglinton Street; and
"3. D. E., inspector of police, F Division; all of Glasgow.

"External Examination.—The body was that of a well-nourished person, somewhat inclined to stoutness. It was stiff from death-stiffening. The only mark of violence visible on the body was a clean-cut wound situated one and a half inches below the level of the left collar-bone, and two and a quarter inches from the middle line of the breast-bone. It measured eleven-sixteenths of an inch in length and five-sixteenths of an inch in breadth, and was of an ovoid shape. In the neighbourhood of the wound there were some thin smears of blood on the body.

"Internal Examination.—

"*Head Cavity.*—The brain and its coverings were found normal.

"*Chest Cavity.*—On the chest being opened in the usual method a considerable quantity of clotted blood (ten ounces by measure) was found lying below the breast-bone and extending into the left side of the chest. On the bag which contains the heart being opened, fluid and clotted blood, to the amount of nine ounces by measure, was found within it. There was, in addition, about six ounces of blood by measure in the left cavity of the chest. Before the organs of the chest were removed, careful inspection was made to see if the wound on the front of the chest was continued through the chest wall into the chest. This inspection showed that the wound had a direction downwards and from the left toward the right, that it had penetrated the chest wall, and that it was continued into the flesh below the chest wall between the first and second ribs. After removal of the parts, entire, from the chest, and after further inspection and dissection, the wound was traced from the point where it had entered the flesh beneath the ribs, through the heart-bag, and into the main artery of the body which leads from the left chamber of the heart. The wound had penetrated this blood-vessel at a point one and a quarter inches above the point where the vessel leaves the heart. The wound on the inside of the wall of the heart-bag measured five-sixteenths of an inch in length, and in the blood-vessel nine-thirty-secondths ($\frac{9}{32}$ths) of an inch. These two wounds lay with relation to one another in a slightly slanting line, the one below the other. From these wounds the blood found in the heart-bag and in the chest had escaped. The structure of the heart itself was normal. The lungs were healthy.

"*Abdominal Cavity.*—The organs of this cavity were all examined, and, with the exception of the liver, which was somewhat fatty, were found healthy.

"*Opinion.*—From the foregoing examination we are of opinion: (1) that the

cause of death was the wounding of the main blood-vessel from the heart, and the internal bleeding consequent thereupon; (2) that the wound produced on the wall of the chest and continued through the wall, through the heart-bag, and into the said main blood-vessel, was caused by a sharp-pointed, sharp-edged instrument of some inches in length; and (3) that the blow must have been inflicted with considerable force.

"These are attested on soul and conscience.

"(Signed) "

Reports regarding the nature of stains upon clothing or other material may be required of the examiner. No warrant is required for this; it is done in Scotland at the written request of the Procurator-Fiscal, who sends to the residence or laboratory of the examiner an officer with the objects to be examined, who demands from the examiner a receipt for the articles before confiding them to his custody. This is for the purpose of maintaining their identity. The examination will depend on the substance to be examined for; but, in any case, the investigation ought to proceed on systematic lines. This work is usually confided to experts, of whose capability no question is likely to be raised. The report of the examination is based upon like lines to that of a post-mortem examination, except that, after stating by whose instructions the examination was made, the reporter should state from whom he received the articles (giving full particulars as to his identity), then, generally, should describe the articles: after which the physical examination of the garments or weapons or other substance should be described with reference to (*a*) presence or absence of stains; if present, (*b*) their number and situation, relative to their position on the garment and to one another; (*c*) their shape; (*d*) their colour; and (*e*) other physical characteristics. With reference to the chemical, spectroscopic, or microscopic technique of the examination, it is not necessary to enter into details in the report; it is sufficient to say that, after an examination by chemical analysis or microscopic or spectroscopic examination, certain substances were or were not found. Then follows the opinion of the reporter, the attestation "on soul and conscience," and signature. The following is an example of such a report:—

"Place.
"Date.

"I hereby certify that, on Wednesday the 24th July, I received from J. B., criminal officer of A Division of Police, a parcel containing a blue cloth jacket, with label attached, and a letter from J. M. R., Esquire, Procurator-Fiscal of the County of ———, which directed me to make an investigation into the character and composition of certain coloured stains thereupon.

"I found the following coloured stains upon the garment, viz.:—

"1. On the left lapel of the jacket—

"(*a*) A circular, red-coloured stain, situated close to the junction of the neck-seam and lapel, which measured five-thirty-secondths of an inch in diameter;

"(*b*) A circular, red-coloured stain, situated one and a half inches lower down on lapel from the former stain, which measured three-thirty-secondths of an inch in diameter;

"(*c*) A circular, red-coloured stain, situated close beside the last, and almost touching it, which measured one-sixteenth of an inch in diameter; and

"(*d*) Adjacent to the last named, seven smaller and less definitely marked stains.

"2. On left inner flap (which was marked with irregular-shaped splashes of mud, bearing the appearance of having been rubbed or partially wiped)—

"(*a*) A stain, shaped like an inverted soda-water bottle, situated three and one-eighth inches above the level of the first button-hole, and a like distance from the free edge of jacket, which measured seven-thirty-secondths of an inch in length;

"(*b*) A stain, of similar shape to the last, situated seven-eighths of an inch above the level of the first button-hole, and two and a quarter inches from the free edge of jacket, which measured five-thirty-secondths of an inch in length;

"(*c*) A circular stain, situated seven-eighths of an inch from the last, which measured one-sixteenth of an inch in diameter; and

"(*d*) An irregularly-shaped stain, situated five inches from the free edge of jacket, which measured five-thirty-secondths of an inch at its point of greatest breadth.

"The foregoing stains were examined by different tests—microscopic, physical, and chemical—and from the results I am of opinion: (1) That the stains above described are composed of blood; (2) that the blood belongs to the class of animals—mammalian—to which man belongs; and (3) from the inverted soda-water-bottle shape of two of the said stains on the inside of the left flap of jacket, that the blood was forcibly projected against the garment from its source.

"These are attested on soul and conscience.

"(Signed) , M.D."

III.—Notes and Memoranda.—Notes or memoranda may be used in a court of law by a medical witness. Such are not, however, part of the *res gestae*—they do not become documents in the case—but if they are used by the witness, they may be demanded by cross-examining counsel for scrutiny and perusal.

It not infrequently happens that a lapse of time intervenes between the event from which the notes originated and the trial of the accused, and it is hardly to be expected that a busy man could charge his memory alone during the interval with every single detail of the case in which he is now a witness; accordingly, a careful witness will have with him in the witness-box the notes or memoranda in which are written the facts of which he is about to give testimony. It is necessary therefore to know under what circumstances the use of such notes is allowable, and under what others they are not permissible. The law on this point is as follows:—*Such notes may be used by a witness for the purpose of refreshing the memory:* (*a*) If the said notes were made at the time of, or shortly after, the occurrence of the event; and (*b*) if they were made by the witness himself, or by another and reviewed at the time by the witness. On the other hand, they may not be used: (*a*) if they were made only after a lapse of time after the event; (*b*) if they were made by another and not supervised by the witness at the time; or (*c*) if they are used for the purpose of bringing forward facts which the witness has forgotten. Therefore, a witness in using notes ought to remember that they are for the purpose of refreshing the memory, and that it is essential in order that his evidence be received that, having looked at the writing, he should then be able to swear to the point on which he is testifying *from his own recollection.*

IV.—Dying Declarations.—As it may, at some time or another,

become the duty of a medical witness to listen to statements made by persons who are dying from culpable violence or other culpable cause, and as such statements might be of great moment in the attainment of justice, it is necessary that medical men should know what their duty is in this particular. Should it happen under circumstances as the foregoing that death is likely to happen before a magistrate could arrive, it becomes the duty of a medical man to write down, before witnesses, such a statement as the dying person may voluntarily choose to make, and as far as possible *verbatim et literatim*. Should, however, any question have to be asked to make clear any statement which, without the explanation, would be obscure, both the question and the answer should be exactly written.

In English law, the following are the conditions necessary to constitute such a dying declaration legal, viz.:—

1. A prisoner must be on his trial for murder or manslaughter;
2. The declarant, at the time the declaration was made, must have been in complete possession of his senses, in actual danger of death, and must have given up all hope of recovery; and
3. The declaration must have reference to the circumstances causative of the impending death of the declarant.

To all intents and purposes, the law of Scotland is identical with that of England. The reception of a dying declaration in a court of law—for, after all, it is but hearsay evidence—is based upon the presumption that a statement made while a person knows himself to be dying is of equivalent value to evidence given upon oath. It is, indeed, supposed that the solemnity of the circumstances, and the absence of causes which might incite to false witness, so act upon the mind of the dying person, that his sole aim and intention will be to speak the truth. Should a person in making such a declaration let fall any utterance that betokens any hope of recovery—even should he die later—the declaration becomes invalid. But the question arises, Must the person, in making the statement, definitely declare his belief of impending death, and of no hope of recovery, in order that the declaration be valid? According to Scots law, it would appear that the sense of impending death may be inferred as well from the actions of the person as from his verbal utterances. In any case, after the declaration has been made it ought to be signed by the medical man, the witnesses, and, if possible, by the declarant himself.

The following are examples of rulings on such points:—

In R. *v.* Foster, 6 C. & P. 325, it was held in a trial for manslaughter that a statement made by the deceased as to the cause of the accident immediately after he was knocked down was admissible. In R. *v.* Barrett (Leeds Lent Assizes, 1869), Baron Cleasby ruled inadmissible as a dying declaration a statement in which the dying person said "she thought she should not recover." And in the case of R. *v.* Horsford, Mr. Justice Hawkins remarked of the dying statements of the deceased woman: "I am quite satisfied myself that anything a suffering person says with regard to her bodily sensations, and questions touching the case, are admissible. . . . You must have evidence that she was in apprehension of death, that she was personally feeling that she was dying." The deceased said voluntarily to

her medical attendant, "I believe I am poisoned." He asked her what she had taken, and her reply was, "I have taken a powder." In reply to the judge, the medical attendant stated that "no one in her condition could possibly entertain a hope of recovery. Her face bore a terrified expression, and her struggles showed the extremity of her condition." It was proved that the prisoner had sent her the powder, and that it contained strychnia (Huntingdon Assizes, 1899). Where a medical man is called upon to take such a declaration, he will do well to attend to the fulfilment of the following conditions, viz. :—(1) That the person expresses a conviction of impending death, or that such a sense of impending death, and that all hope of recovery is past may be inferred from the nature of the injuries; (2) that the mind of the patient is in a fit state for the purpose; (3) that the exact words used, and the order in which they were uttered, be put down; (4) that the statements were voluntarily made; (5) that no questions, other than those necessary for the explanation of obscure statements, should be put, and if such are put, the words of the question and answer are to be written down; and (6) that the dying person should, if able, sign the statement as well as himself and the other witnesses, or failing the ability of the person, to sign by himself and the other witnesses.

(*B*) **Parole, Oral, or "Viva Voce" Evidence.**—Whether medical evidence take originally the documentary or the experimental form, it must ultimately take the oral form before it can become valid evidence for or against an accused person at the trial for the offence. The only exception to its being given in court is where, for good reasons shown, it has been taken on commission, this being held equivalent to evidence given before the court, since the counsel for the prisoner will be present on the occasion.

Oral evidence can only be valid when given upon oath or affirmation. At the same time, it is within the option of a presiding judge, on being satisfied that the taking of an oath would have no binding effect on the conscience of a witness, to accept the evidence on a *promise* to tell the truth, which promise, with respect to the law of perjury, would have the binding effect of an oath or affirmation.

Up till the year 1888 the mode of administering the oath in England was very different from that obtaining in Scotland, and, unless on the option of a witness, even now is different. Apart from affirming, the witness formerly took, and may even yet take, the oath on bowing assent to the words that, "touching the death of ," the evidence he shall give "shall be the truth, the whole truth, and nothing but the truth, so help you God," and, thereafter, kissing the book. Since the above date, however, a witness has the option in *any* English court to take the oath after the Scots fashion, by virtue of the Oaths Act, 1888 (51 & 52 Vict. c. 46). The terms of this Act are as follows:—

"Section I. Every person upon objecting to being sworn, and stating as the ground of such objection either that he has no religious belief, or that the taking of an oath is contrary to his religious belief, shall be permitted to make his solemn affirmation instead of taking an oath in all places and for all purposes where an oath is or shall be

required by law, which affirmation shall be of the same force and effect as if he had taken the oath; and if any person making such affirmation shall wilfully, falsely, and corruptly affirm any matter or thing which, if deposed on oath, would have amounted to wilful and corrupt perjury, he shall be liable to prosecution, indictment, sentence, and punishment, in all respects as if he had committed wilful and corrupt perjury.

"Section II. Every such affirmation shall be as follows:—'I, A. B., do solemnly, sincerely, and truly declare and affirm,' and then proceed with the words of the oath prescribed by law, omitting any word of imprecation or calling to witness.

"Section III. Where an oath has been duly administered and taken, the fact that the person to whom the same was administered had, at the time of taking such oath, no religious belief, shall not for any purpose affect the validity of such oath.

"Section IV. Every affirmation in writing shall commence: 'I, , of , do solemnly and sincerely affirm,' and the form in lieu of jurat shall be: 'Affirmed at this day of , 19 . Before me.'

"Section V. *If any person to whom an oath is administered desires to swear with uplifted hand, in the form and manner in which an oath is usually administered in Scotland, he shall be permitted so to do, and the oath shall be administered to him in such form and manner without further question.*"

Section VI. refers to the Acts which are repealed in the accompanying Schedule; and Section VII. to the short title of the Act, viz., The Oaths Act, 1888.

From the foregoing, therefore, it will be seen that any witness in any court in England may claim the privilege of taking the oath in the Scots fashion, which is not attended by any of the risks which are associated with the repetitive kissing of a book (the New Testament) by a variety of persons, some of whom may, at the time of kissing, be the actual victims of syphilitic or other infective disease. The foregoing Act assumes that those charged with the duty of administering the oath are conversant with the Scottish mode of administration, and the form of words used. In England, an official, usually the clerk of court, repeats the formula of words, and all the witness has to do is to "kiss the book." In Scotland, on the other hand, the oath is administered by the judge, who, speaking the words of the oath, requests the witness to repeat the words after him, clause by clause. The words of the oath in Scotland are as follows:—

"I swear by Almighty God, as I shall answer to God at the great Day of Judgment, that I will tell the truth, the whole truth, and nothing but the truth."

Certain judges omit the words, "as I shall answer to God at the great Day of Judgment" for the sake of brevity. These words are repeated clause by clause, by the witness after the judge or magistrate, his right hand being uplifted all the time. A few years after the passing of this Act we had occasion to give evidence before an English stipendiary magistrate in a summary prosecution under the Foods and Drugs Acts, and we claimed the privilege of Section V.

of the above Act. The magistrate frankly owned that he did not know the form of words, which, however, we supplied; and thus the difficulty was got over, and a precedent established in that court. Medical witnesses, therefore, should understand that they possess this privilege, and no judge or magistrate may gainsay the claim; we believe further, that it is the duty of the medical profession, from a hygienic point of view, to secure full establishment of the Scots mode of administration. Both in respect of its being more in accordance with sanitary principles, and of its greater solemnity, this mode is to be preferred.

In giving evidence in the witness-box, as in documentary evidence, there are certain principles which should never be forgotten by the medical witness. In the first place, the language of the witness-box should be as *simple* and *as untechnical as possible*. Let it be borne in mind that, although the technical speech used in conversation among medical men may be well understood by themselves, the same relationship does not obtain in the law-court. The witness is there for the purpose of affording the court and the jury such information as medical knowledge is able to give on the facts of the case; therefore, he fails in his purpose if he be unable to convey such information to men of differing grades of education, and men who, though skilled in the law, do not necessarily possess any knowledge of medicine. Let technical expressions, therefore, be dropped, and let as plain English as possible be substituted. Such terms as "syncope," "comatose," "highly vascular," "œdematous," and the like ought never to be used. It is impossible to expect a jury to know what is meant by the terms "pericardium," "meninges," "calvarium"; and it is quite as easy to say "heart-bag," "brain-coverings," and "skull-cap" or "vault of skull." In the second place, the language should be *concise*. The witness will be well advised who does not use a dozen words to express what could be equally well done in half that number. Let adjectives of degree, and especially superlatives, be as scarce as possible, since the use of the latter may easily be interpreted to mean partisanship, and nothing discounts the value of any evidence so much as a suspicion of this. Moreover, the voluble witness is often a godsend to an opposing counsel with a weak case, since the witness in saying more than he ought is apt to say more than he means; hence the greater number of opportunities for interpreting double meanings in answers. Categorical answers, when possible, are the best; and when impossible, answers should be concise, but luminous. In the third place, the language should be *courteous*. This is not difficult during the examination-in-chief of a witness, because the witness and the examiner are in accord; it becomes less easy, however, during cross-examination, since the object of the cross-examiner is to weaken, water down, or, if possible, to negative the former evidence. If the witness keep in remembrance, however trying the situation, that he is there solely for the purpose of speaking the whole truth, he has but consistently to hold by what he has formerly said, and to give fully the reasons for his belief to convince the court of his *bonâ fides* as a witness. It is usually with reference to opinions or inferences that differences between counsel and witness

arise. Further, it may be of assistance to the witness in taking a charitable view of his cross-examination, if he bear in mind that it is the business of the cross-examiner to make the best case he can for his client. Calm, patient, but persistent re-statement of former evidence will sooner or later break down even the most urgent cross-examiner. There are but few members of the bar, we believe, who wilfully play the bully. Bullying a witness is, however, recognised by the bar to be quite legitimate under certain circumstances. But even that will fail by maintenance of temper and a courteous, but firm, attitude on the part of the witness. He may rely upon the judge interfering when he thinks counsel oversteps the bounds of legitimate cross-examination. In short, if the witness can preserve himself free of the assumption that cross-examining counsel is his natural enemy, and if he does not, therefore, assume the mental attitude appropriate to that view, he will leave the witness-box, if otherwise he has been well prepared, with credit. There are occasions, however, upon which it is absolutely necessary for a medical witness to maintain a very firm attitude, and to decline firmly, but pleasantly, to have words put into his mouth which he had not uttered. Unwittingly or intentionally—we believe, in most cases, the former—cross-examining counsel may ask a question at a witness which is based upon a statement which he desires the witness to understand he has already made in reply to a previous question, and the answer to which tends to put an entirely different complexion upon the tenor of his testimony. If the witness be cool and self-possessed, he will detect the mis-statement and at once challenge it. Should the counsel persist in stating that the witness made the statement, the witness should appeal to the notes of the judge, from which the matter will soon be settled. More than once have we had to take this step.

The only additional point to be attended to by the witness, and it is also an important one, is *to speak distinctly, deliberately, and audibly* while in the witness-box. It has often been said by judges that no witnesses are so difficult to be heard and to be understood as medical witnesses—difficult to be heard from want of clearness of articulation, and difficult to be understood by reason of the nature of the evidence they alone are able to offer, aided, not infrequently, by the technical language they are apt to use.

Respecting evidence-giving in general, there are certain points to be borne in mind. The general rule is that witnesses must speak only to matters of fact and not of opinion. But a medical witness, in his usual capacity as such, speaks both to matters of fact and of opinion, and therefore he is deemed by a court of law to come within the category of expert or skilled witnesses; at the same time, he may only be called upon to give evidence on matters of opinion and not of fact. As a general rule, subject to certain exceptions, such as in the case of dying declarations, hearsay evidence is not valid evidence; therefore the witness must speak only to facts which come within his own personal knowledge. Further, any opinion which he gives from any given series of facts must only be his own opinion. He is not entitled, for example, to cite the opinions of others as corroborative

of his own, since the persons holding such opinions cannot be available for cross-examination in open court. At first sight this would seem incongruous, for of all places in the world there is none in which such deference is paid to authorities and opinions as a court of law. And some medical men have had the courage to point this out. In the famous trial of Spencer Cowper, narrated in Hargrave's "State Trials," Dr. Crell, one of the medical witnesses, referred in his evidence to the then authorities on the subject of drowning, but this was objected to by the court. To this the witness replied: "My lord, it must be reading, as well as a man's own experience, that will make any one a physician; for without the reading of books in that art, the art itself cannot be attained to. I humbly conceive that in such a difficult case as this, we ought to have a great deference for the reports and opinions of learned men; neither do I see any reason why I should not quote the fathers in my profession in this case, as well as you gentlemen of the long robe quote Coke upon Littleton in others." The witness was allowed to proceed. We have quoted from authorities, not, however, in a criminal case, but in one pertaining to a question in public health. The difficulty, however, may be got over by adopting as your opinion the opinions of others whom you are entitled to name. Besides, it is by no means an uncommon practice in criminal cases for cross-examining counsel to read certain passages from a standard book on the subject, with the intention of rebutting evidence given by the witness in his examination-in-chief, and to ask the witness if he agree or disagree with the author. In such a case, our advice to a witness is never to offer any reply until he asks to be allowed, and has been permitted, to peruse the quotation as given in the book for himself, and even then not to answer *until he has carefully read the passage quoted and the context.* Any statement which a witness has made on precognition, but which he has modified in the witness-box, cannot be challenged on the ground that he made a different statement on a former occasion unless it amounts to wilful perjury, when he may be arrested on leaving the witness-box. Again, the character of a witness cannot be attacked in the witness-box; at the same time, it is competent for counsel to ask a witness if he has been convicted, or then stands indicted, for a crime.

In the giving of testimony, there are certain privileges and disabilities associated with that duty. Of the former, it may be stated that no witness can be compelled to answer any question which may have the effect of incriminating himself, or which would tend to degrade his character, socially or professionally. In Paris and Fonblanque's work on Forensic Medicine[1] are narrated the facts of a case, tried at the Old Bailey Sessions in June 1821, in which a man was being tried for the murder of another in a duel, and in which Mr. Pettigrew, a surgeon, was called as the first witness. The witness, on entering the witness-box, was thus cautioned before giving his evidence by Mr. Justice Bailey: "Mr. Pettigrew, I think it necessary to give you the caution, if you think the evidence which you are about to give likely to expose you to a criminal prosecution,

[1] Page 165.

you are not bound to give it." Whereupon Mr. Pettigrew very properly declined to answer any questions, since duelling being an offence against the law, any evidence which would have indicated his presence there, even in a professional capacity, would have rendered him *particeps criminis*. Cases in the latter category are, fortunately, rare. In one case, however,[1] a medical witness, in a trial for rape, was asked, on cross-examination, if he had been in the way of having connection with the woman said to have been ravished. He hesitated for some time whether to answer or not, when it occurred to him to ask if he must answer the question, and on being assured that he need not do so unless he chose, he said, as if feeling relieved, "Then I refuse to answer."

The above case of Mr. Pettigrew practically illustrates the only circumstances in which a medical man may refuse to disclose information to a court of law. No witness, medical or other, is obliged to give evidence which would tend to incriminate himself. In view, however, of the very important question and all-reaching character of the subject of professional privilege, detailed consideration must be given to it.

Professional Privilege.—It is the law in Great Britain and Ireland *that secrets of patients obtained by medical men in the course of their profession cannot be withheld from a court of law if their revelation be necessary for the purposes of the law.*

There are some, however, who are inclined to dispute the wholesomeness of such a law, and who point to the practices of the law of other countries in maintaining that any information acquired by a medical attendant in attending a patient should not be compulsorily disclosable, and that it ought to be privileged; and it is but recently that an example has offered of a medical witness who was willing rather to suffer the pains of law than reveal such secrets. The question may be looked at from two points of view, viz., the moral or ethical, and the legal.

MEDICAL OATH.

Since the days of Hippocrates down to the present, medical men have bound themselves not to reveal such professional secrets. The oath of Hippocrates reads as follows:[2]—"I swear by Apollo, the physician, and Esculapius, and Health, and All-Heal, and all the gods and goddesses, that, according to my ability and judgment, I will keep this oath and this stipulation—to reckon on him who taught me this art equally dear to me as my parents, to share my substance with him and relieve his necessities if required; to look upon his offspring in the same footing as my own brothers, and to teach them this art, if they shall wish to learn it, without fee or stipulation; and that by precept, lecture, and every other mode of instruction I will impart a knowledge of the art to my own sons and those of my teachers, and to disciples bound by a stipulation and oath according to the law of medicine, but to none others. I will follow that system of regimen

[1] Ogston's "Lectures on Medical Jurisprudence," p. 21.
[2] *Vide* The Sydenham Society edition of the Works of Hippocrates.

which, according to my ability and judgment, I consider for the benefit of my patients, and abstain from whatever is deleterious and mischievous. I will give no deadly medicine to any one if asked, nor suggest any such counsel; and in like manner, I will not give to a woman a pessary to produce abortion. With purity and with holiness I will pass my life and practise my art. I will not cut persons labouring under the stone, but will leave this to be done by men who are practitioners of this work. Into whatever houses I enter I will go into them for the benefit of the sick, and will abstain from every voluntary act of mischief and corruption; and, further, from the seduction of females or males, of freemen and slaves. Whatever, in connection with my professional practice, or not in connection with it, I see or hear in the life of men which ought not to be spoken of abroad I will not divulge, as reckoning that all such should be kept secret. While I continue to keep this oath unviolated, may it be granted to me to enjoy life and the practice of the art respected by all men in all times. But, should I trespass and violate this oath, may the reverse be my lot."

In the Scottish Universities up till the year 1868, each graduate in medicine had to take an oath in Latin, which generally embodied these principles with reference to his relation to the sick; but on the passing of the Promissory Oaths Act in that year, a declaration in English was substituted therefor, which is in the following terms:—"I do solemnly and sincerely declare, that, as a Graduate in Medicine of the University of ——, I will exercise the several parts of my profession, to the best of my knowledge and abilities, for the good, safety, and welfare of all persons committing themselves, or committed, to my care and direction, and that I will not knowingly or intentionally do anything or administer anything to them to their hurt or prejudice, for any consideration, or from any motive whatever. And I further declare, that I will keep silence as to anything I have seen or heard while visiting the sick which it would be improper to divulge. And I make this solemn declaration in virtue of the provisions of the Promissory Oaths Act, 1868, substituting a declaration for oaths in certain cases."

In like manner, the medical and surgical Corporations exact a declaration of their licentiates, which, however, is not couched in like terms. The licentiate promises to maintain and defend the rights and privileges of the corporations of which he is about to become a member, to obey all the laws made by the said corporations, and he further promises, under pain of forfeiture of his diplomas, that he shall not advertise nor employ any other unbecoming method of obtaining practice, nor allow his name to be connected with any one who so acts, or who is engaged in any discreditable kind of medical work.

From the ethical side, therefore, it may be taken that there exists every reason why a medical practitioner should not only entirely dissociate himself from any discreditable conduct or conduct infamous in a professional respect, but also that he should keep inviolate all secrets which may be imparted to him by his patients, or to which he may attain in the course of his professional association with them.

This is not only right and proper, but violation of such a trust is justly visited by the pains of law.

PROFESSIONAL SECRECY.

From the legal side, however, the question must be viewed differently. In the first place, any rules, such as the foregoing, which a corporate body may make for the maintenance of its honour by those who are members of it, or any rules which such a body may impose on its members by virtue of any Act of Parliament, can only have validity so far as they are in consonance with the law of the land. Such, therefore, are subservient to the law. It is because it is a statutory enactment (16 and 17 Vict. c. 83, s. 3) that the communications between husband and wife are privileged; and although it is not covered by statute, a rule exists whereby any communication between a legal adviser and his client is also privileged. The settled law of this country is, that a medical witness cannot claim any privilege. This was first laid down by Lord Mansfield in the trial of the Duchess of Kingston for bigamy, before the House of Lords in 1776. Mr. Cæsar Hawkins, sergeant-surgeon to the King, was asked whether he knew of any marriage between the accused and the Earl of Bristol, who was believed to be her husband when she went through the ceremony of marriage with the Duke of Kingston. To this he replied: "I do not know how far anything that has come before me in a confidential trust in my profession should be disclosed consistent with my professional honour;" on which Lord Mansfield said, "I suppose Mr. Hawkins means to demur to the question upon the ground that it came to his knowledge some way from his being employed as surgeon for one or both of the parties. . . . If no lord differs in opinion, but thinks that a surgeon has no privilege to avoid giving evidence in a court of justice, but is bound by the law of the land to do it, Mr. Hawkins will understand that it is your judgment and opinion that a surgeon has no privilege, where it is a material question in a civil or criminal cause to know whether parties were married, or whether a child was born, to say that his introduction to the parties was in the course of his profession, and in that way he came to the knowledge of it. I take it for granted that if Mr. Hawkins understands that, it is a satisfaction to him, and a clear justification to all the world. If a surgeon was voluntarily to reveal those secrets, to be sure he would be guilty of a breach of honour and of a great indiscretion; but to give that information in a court of justice, which, by the law of the land, he is bound to do, will never be imputed to him as any indiscretion whatever" (20 S. T., p. 735); *vide*, also, Harg. S. T., 243). The same ruling was recognised in Wilson *v.* Rastall, 4 T. R., p. 760. In Rex *v.* Gibbons (1 C. P., 97) a surgeon, who was called to prove confessions made to him by a female prisoner who was being tried for the murder of her child, objected to give evidence on the ground that he obtained what knowledge he had from his professional attendance on the prisoner; but Park, J., overruled the objection, saying, "that is no sufficient reason to prevent a disclosure

for the purpose of justice;" and in Broad *v.* Pitt, 3 C. P., 518, Best, C. J., stated that "there is no privilege of this description in the case of a medical man."

Such instances suffice to show that a medical witness must disclose, when a judge so rules, any secret information of which he may be possessor by virtue of his professional relationship to a party in the case. The most recent development of the subject occurred (1900) in Nottingham, where a medical man, in an action by a man for nullification of a maintenance order on the ground of his wife's adultery, was summoned to give evidence touching the cause of an illness which the defendant had during the period of separation. The practitioner, who was a graduate of a Scottish university, and who had subscribed the declaration already given, declined to reveal the character of the illness on the following grounds, viz.: first, that it would be a breach of professional secrecy, which the witness held to be inviolable; second, that it would be an infringement of his academic declaration; third, that by such infringement he might be rendered liable to pains and penalties by the General Medical Council; fourth, that his answering might render him subject to an action at law by the defendant in the case; fifth, that no high legal decision had hitherto been given as to the power of magistrates to compel answers to questions of professional secrecy in a civil court; sixth, that Mr. Justice Hawkins, in Kitson *v.* Playfair, had said, "That he could quite understand a case, especially a civil cause, where a doctor was quite justified in refusing to divulge questions of professional secrecy;" and for other reasons, particularly that this was a question which ought to be decided by the highest law court. The solicitor for the plaintiff asked the magistrates to commit the medical practitioner, in terms of Section 7 of the Summary Jurisdiction Act, 1848, which renders any person refusing to give evidence, unless he gave a just and reasonable excuse, liable to a term of imprisonment not exceeding seven days. The bench, after consideration, decided not to order the practitioner to answer the question, as they were of opinion that he had offered a just excuse for refusing; and that as the question was one of an interesting and novel character, they would be pleased to offer any facilities for appeal to a higher court.

It is interesting to note that medical men in certain parts of the world are in a different position; for example, by the Evidence Further Amendment Act, New Zealand, 1885, it is provided, *inter alia*, that (*a*) all communications made to a physician or surgeon in his professional character by any of his patients shall be privileged, and shall not be admissible in evidence in any civil or criminal proceedings, except with the express consent of the person alleged to have made such communication. The word "communication" in the Act includes all information acquired which is necessary to enable a physician to prescribe, or a surgeon to do any act, for his patient, but it does not include any communication made for a criminal purpose, nor does the above section prejudice the right to give evidence respecting statements made for the purpose of effecting insurance on the life of any person. In America also, in seventeen different States and territories, Statutes have been passed which enact that such professional secrets shall be

deemed privileged, overriding the rule at common law; in the State of Connecticut, however, the common law rule prevails, and disclosure is compelled when necessary. In France, moreover, medical witnesses claim the same privileges of secrecy as the priests.

On this point, therefore, medical men in this country must reckon upon their liability to be called upon to make such disclosures when necessary. At the same time, a medical witness should always be reluctant in a court of law to disclose such secrets, and he should ask for a ruling of the court before he makes disclosure. Such action will, at least, convince the public that the medical profession jealously guards that which has been committed to the members of it as confidential, and that it is loth to make revelation unless compelled by law to do so.

The other aspect of professional privilege arises in the question, *Whether a medical man may, under any circumstances, be permitted legally in the ordinary relations of life to divulge confidence obtained in the practice of his profession?* In the Court of Session (A. B. *v.* C. D., 14 Dunlop, 2nd Series, 177) it has been decided that "secrecy is an essential condition of the contract between a medical man and his employers, and breach of secrecy affords a relevant ground for an action of damages." This, therefore, may be taken as a general expression of the law. Out of this broad question has arisen the specific one, *May a medical man for the protection of the honour of his wife and children violate confidence which he has received as the medical attendant of his relative?* While the question must be answered on the merits of each particular case, perhaps no more pertinent case, involving the above issues, will offer than that of Kitson and Wife *v.* Playfair, which was tried in 1896 before Sir Henry Hawkins and a jury. The charge against the defendant was that he had published a statement concerning the pursuer that she had "had a miscarriage under such circumstances that her pregnancy could not have been of a legitimate character." The principal defence was that, as the statement was made to a brother-in-law of one of the plaintiffs by the defendant on behalf of his wife, who was a sister of one of the plaintiffs, it was a privileged statement. The substance of the defendant's statement being one in which the family honour was involved, and having been made to a member of that family, there was much apparently to remove it from the category of ordinary slander, and to justify it being reckoned among privileged statements. According to the law, however, any statement is either privileged, or it is not. Mr. Justice Hawkins in his summing-up tersely defined a statement of privilege in the following way: "The rule was, that if a man made a charge derogatory to the character of another, if he could show that it was made upon an occasion upon which he was privileged in speaking out, or writing the words if they were contained in a letter, and that he made it honestly and *bonâ fide*, and merely in the discharge of a duty which he felt was incumbent upon him, without any sinister motive, and without any ill-feeling, it might happen that he would be entitled to say words, even though they did great injury, under the plea of privilege. . . . . .

"The plea of privilege could not prevail if a man did not really make the communication under a sense of duty and obligation cast upon

him to make it. If he did it for the mere purpose of doing a bad turn to a man, or getting gain for himself, or putting pressure on a man he had no right to put, or in a spirit of irritation or anger, or for anything of that sort, it was not privileged." The female plaintiff at the time she called for the professional assistance of the defendant was in the enjoyment of an allowance of £400 a year from the brother of her husband. After the statement complained of was made, this allowance was stopped. She thereupon asked for an interview with the defendant, but for answer she was advised by him "to make her illness an excuse for leaving London, so that their families should not be brought into contact, otherwise he would have to place the matter in the hands of his wife." The questions which the learned judge put to the jury for answer were these, viz.: "(1) Were the words uttered as alleged? (2) Did the defendant believe the words to be true? (3) Were they uttered in good faith and without malice? (4) Were they uttered not from a mere sense of duty, but from some indirect motive, or to gratify feelings of ill-will, anger, or irritation against the plaintiff or her husband? (5) If verdict for the plaintiff, what were the damages?"

From the summing-up of the judge, and from his remarks when a stay of execution was discussed before him, it was obvious that he did not think the statement was a privileged one. The jury answered the queries against the defendant, and returned a verdict for the plaintiff, naming the damages at £12,000.

In the remarks of the judge on the general question of professional secrecy as interpreted by the evidence of medical witnesses called to speak upon this, several important *dicta* must be noted. For example, he said, "It must be remembered that the medical profession had no right to legislate on the matter [as to the rule of inviolable secrecy]. They might make their own rules—and, he dare say, did to the best of their ability—for their guidance as professional men, but they could not impose upon the public their self-made laws as being binding upon them. The medical gentlemen called on behalf of Dr. Playfair said that they were only rules by which they regulated their own conduct. They mentioned two exceptions. In the case of a witness being called into the witness-box in a court of justice, and asked to divulge a professional secret, they held that under those circumstances they were bound to give utterance to it. He would not himself discuss that point, because he had a little doubt whether the rule could be stated so generally as that. Although the judge was the person who had to rule whether or not a witness was to answer a question—and if a witness did not answer according to that ruling he might be committed for contempt of court—yet one would suppose that a judge would exercise discretion in ordering a witness to answer or not. Having regard to a variety of circumstances, there might be some matters which the judge might think most unreasonable to be divulged by a professional man, and therefore he might refuse to permit it, and allow the witness to say, 'I refuse to answer.' Each case must be considered by its own particular circumstances, and by the ruling of the judge who happened to preside on the occasion. It must be taken for granted that the judge would

decide according to law. It could not be presumed otherwise, as in that case the court's law would get into sad disorder. There was always a rule to set a judge right if he went wrong; on the occasion, however, on which he was ruling, his ruling would have to be taken as law. It was also said by the medical witnesses that if in the course of professional practice they came across a case which indicated either that a crime had been committed, or was about to be committed, that under these circumstances they were bound to divulge it. To whom? To the Public Prosecutor! If a poor, wretched woman committed an offence for the purpose of getting rid of that with which she was pregnant, and of saving her character, her reputation, and, it might be, her very means of livelihood, and if a doctor was called in to assist her—not in procuring abortion, for that in itself was a crime—but called in for the purpose of attending her and giving her medical advice—how she might be cured so as to go forth about her business—he doubted very, very, very much whether he would be justified in going forth and saying to the Public Prosecutor, 'I have been attending a poor young woman who has been trying to procure abortion with the assistance of her sister. She is now pretty well, and is getting better, and in the course of a few days she will be out again, but I think I ought to put you on to the woman.' To his mind, a thing like that would be monstrous cruelty. He did not know what the jury's view would be; he spoke only of his own. Therefore, when it was said that there was a general rule existing in the medical profession, that whensoever they saw in the course of their medical attendance, that a crime had been committed, or was about to be committed, they were in all cases to go off to the Public Prosecutor, he was bound to say that it was not a rule which met with his approbation, and he hoped it would not meet with the approbation of anybody else. There might be cases when it was the obvious duty of a medical man to speak out. In a case of murder, for instance. A man might come with a wound which it might be supposed had been inflicted on him in the course of a deadly scuffle. It would be a monstrous thing if the medical man might screen him, and try to hide the wound, which might be the means of connecting the man with a serious crime. That was a different thing altogether. . . . Communications between a doctor and his wife, or children, were said to be privileged where it was necessary to reveal them in order that the wife or children might be protected. He thought that that required a great deal of limitation, because cases might be imagined where the wife might be living under circumstances in which she did not want any such protection at all, and giving to her a secret belonging to a patient would be only a wanton violation of the rule. However, it was a very delicate question, and would have to be argued some day." For further details of this interesting judgment, the reader is referred to the verbatim account in the *British Medical Journal*.[1]

From this discussion we turn to note the rules which regulate the presence of medical witnesses in court during the hearing of a trial. The rule with reference to witnesses who are to speak

[1] April 4, 1896.

solely as to matters of fact—medical or lay—is, that they should not be present in court when other witnesses are deponing to matters of fact. Medical witnesses for the defence who are to speak to matters of fact and of opinion should not be present while medical witnesses for the Crown are giving evidence. Expert witnesses who are to speak of matters of opinion may remain in court while witnesses are deponing to matters of fact, but they are not permitted to remain while expert witnesses are giving evidence on matters of opinion. On a special motion, however, a medical witness may be permitted to remain in court, although he is to speak only to facts, provided he is withdrawn when other witnesses who are to speak to the same facts are giving evidence (Pritchard, H.C., 1865; 5 Irv. 88). After they have given their evidence—and this applies to all witnesses except in very special circumstances—they are entitled to take a seat in court and hear the conclusion of the case. It is somewhat difficult to say, regarding the evidence usually given by medical witnesses, how far they are witnesses to fact and how far to opinion. In deponing to the correctness and truthfulness of a report, for example, they testify in both directions: they testify to the facts relative to the condition of the person or the body which they have examined—so far they are witnesses of fact; but they also testify regarding the causes of wounds or other lesions found on the body, which are matters of opinion. The purely scientific or expert witness, on the other hand, may speak only with respect to matters of opinion, and any questions put by counsel to such witnesses must relate purely to professional opinion; indeed, questions relating to inferences which may be deduced by the jury from the facts are not relevant, and are therefore disallowed.

Procedure at Trial in Scotland.—Procedure at the trial of a prisoner, or accused person, differs in Scotland from that in England.

After the court has assembled, the diet is called against the prisoner, who is asked by the judge to plead to the indictment against him, which has been read to the prisoner in court by the clerk. If he plead not guilty, then a jury of fifteen men is impanelled, of whom the first person balloted for is the foreman. The advocate-depute then calls the first witness, examines him or her, at the conclusion of which examination-in-chief he or she is cross-examined by counsel for the prisoner at the bar, or "panel," as he is commonly called; the witness may then be re-examined by the advocate-depute on points brought out on cross-examination; thereafter, the judge himself may now (as at any time during the course of the preceding examinations), and any juror, through the medium of the judge, may ask questions of the witness. In this manner witnesses for the Crown give their evidence, and after hearing the last of them the case for the prosecution is finished. Thereafter, witnesses for the defence are called, or not, as the case may be: if called, the position of the respective counsel is reversed with respect to the leading of evidence; and at the conclusion of all the evidence, the advocate-depute addresses the jury, after the counsel for the prisoner; then follows the summing-up of the judge, and the verdict of the jury. Should counsel for the prisoner not

call evidence on behalf of the prisoner, he is entitled to have the last word to the jury before the summing-up of the judge. Notes of the evidence must be taken by the judge during the trial (23 Geo. III. c. 45; and 9 Geo. IV. c. 29). The jury may give a verdict without retiring from the box (54 Geo. III. c. 67), or after retiral, and the verdict is given verbally by the foreman.

What attitude ought a medical witness to assume toward counsel of the opposite side?

This is a question which often puzzles young medical men, and the following advice may save them much mental worry. If a medical witness could always remember that his duty is to aid the ends of justice, his path of duty would appear plainer. He is not a witness for one side; he certainly ought not to constitute himself a partisan. Should, therefore, counsel for the prosecution or the defence désire to precognosce a medical witness who has been called by the defence, or the prosecution, he should not have the slightest hesitation in putting at his disposal any report which he has furnished, or his views on the case at issue, just as he has done for the side for which he has been engaged. The only stipulation which the witness should make is that he shall be remunerated for his trouble. Our practice is to put the same facilities at the command of the prosecuting or defending side, as the case may be, as we have done to the other.

This question arose during the currency of the trial of the Ardlamont case (*vide post*) in the cross-examination of the principal medical witness for the defence, who, when asked by the Solicitor-General if, by the express direction of the prisoner's adviser, he had refused to give any information to the Crown, replied that he had. The Solicitor-General said that it had always been the practice for both prosecution and defence to lodge lists of witnesses with the Crown office on a given day before the trial for the express purpose of obtaining information, and believing that the action of the defence in this case might become a precedent in the absence of any opposition or protest on his part, he desired the Lord Justice Clerk—Lord Kingsburgh—to make some authoritative statement on the point. His Lordship said that nothing could be more prejudicial to either side of the case than that the legal adviser should direct one of the witnesses not to allow himself to be precognosced. He thought it a very grievous mistake. He believed that it had been done, no doubt, in this case from conscientious motives, but he had also no doubt about this, that, in criminal prosecutions, witnesses were not only bound to submit themselves to be precognosced, but were liable to imprisonment if they refused to give evidence. Counsel for the defence pointed out that the witness was not to blame, to which his Lordship replied that he did not blame the doctor, but he affirmed the principle that, in criminal cases, it was the duty of every good citizen to give every information in their power, and, therefore, it was a most unwise thing for any judicial adviser to give that advice.

Medical witnesses are entitled to entertain different views on problems put before them, equally with gentlemen at the bar, despite the criticism which has been launched at the former by judges. This differ-

ence usually arises on questions of opinion, and but rarely on matters of fact. Not infrequently this difference of opinion arises in criminal cases from the fact that the prosecution have bound themselves down to too narrow an issue, or to a particular theory, regarding the production of certain marks of violence. In such cases reasonable differences of opinion may legitimately emerge. We are bound to confess, however, that upon occasion differences are so radical as to be absolutely irreconcilable. Such, however, more frequently occur in civil actions; and so far as can be judged from reports of cases, it is not to be wondered that judges make scathing remarks regarding the evidence tendered. While it might be Utopian to expect that medical witnesses for both sides should confer together regarding every kind of cause, there can be little doubt that benefit would result if the witnesses were reasonable men. In view of such divergence of evidence, the appointment of medical assessors has been seriously proposed, for it is impossible to expect a body of plain men as ordinarily constitutes a jury, or even a judge, to follow intelligently the perplexing theories and doctrines occasionally propounded in the witness-box.

IV. EXPERIMENTAL EVIDENCE.

This form of evidence is sometimes used in court, in cases such as the following, viz.:—

(*a*) Where the precise mode of inflicting certain injuries found upon a body is not readily apparent from the facts as known, or where the theory for the prosecution is combated; for example, whether, in a case of death from a gun-shot wound, the shot was fired from a particular place or direction, or, whether, from a particular distance, the injury found could have been so caused.

This kind of evidence was used both by the prosecution and defence in the famous Ardlamont case.

(*b*) Where a poison, not easily detected by chemical means, is found in the organs of a person who, before death, suffered from symptoms of poisoning, and of which the effects have been tried upon animals or man.

This was resorted to, for example, in the Pritchard (Glasgow) case by Drs. Penny and Maclagan upon rabbits, and in the Lamson case by Dr. Stevenson, both in experiments upon himself and upon mice, the poison being aconitin.

(*c*) Or, where a medical witness or chemist is asked to produce, in the witness-box, the evidence upon which, by chemical or other examination, he relied in coming to a certain conclusion to which he has deponed.

Such examples will suffice to indicate what is, or what ought to be, meant by the term experimental evidence.

General Relations of Medical Witness to Assaulted and Accused Persons.—In connection with evidence-giving there are certain other points on which something falls to be said.

What is the attitude which a medical man ought to assume in the examination of a person who, it is alleged, has been assaulted? His duty, obviously, has direct relation to the evidence of the assault, as exhibited on the body of the person under examination, and it is not his business to play the part of detective by asking questions of the person. His office consists in carefully noting the nature, character, extent, situation, and dimensions of the lesions found on the person, and the effect thereof upon the person; further, it would be his duty to form an opinion, from such examination, of the cause of the injuries with respect to the class of weapon which has produced them. He will be well-advised, if, during the examination, he keep his thoughts to himself; thinking aloud is dangerous at such a time, since if he inadvertently give expression to any view which afterwards he may see reason to change, he may find it confront him when he appears in the witness-box. In examining a dead body upon which injuries are found, he will be further well-advised if he do not allow his judgment to be coloured by statements which are made to him regarding their cause, as further investigation may reveal that a different view may arise on the subject. If he has embodied his views in a report, and has to resile from his original opinion after such further investigation, his evidence is practically negatived at the trial as that of a man of unreliable judgment. It is the business of the detective to find out how such injuries have been caused; it is, therefore, only the duty of the medical man to state what he has seen regarding the injuries and their relation to the death or their effects upon the person, without, then, committing himself to any particular theory or view, the reliability of which he has no means of testing, except by the statements of persons who may, perhaps, be interested in concealing the true cause.

Again. *What is the position of a medical man, whose services may afterwards be demanded as a witness with respect to the examination of an accused person?* This relation may arise in cases of rape, criminal abortion, or of infanticide with respect to recent delivery. Here a medical man must proceed with the utmost caution and frankness. In the first place, it is established law that no legal authority, however high, can compel an accused person to say anything respecting his relation to the crime with which he is charged. When a prisoner, by the criminal law of Scotland, is given an opportunity of emitting a declaration, after his apprehension, it is the duty of the sheriff to warn him that he need not say anything unless he chooses, but that if of his own free will and accord he desires to make any statement, such will be written down, and will be read at his trial. This rule of law applies equally to police officials in their quest for information, and for the like reason. The object of the law, therefore, is to inform the prisoner that he need say nothing which may incriminate himself. We have already seen the application of the same principle with respect to a witness. It is equally good law also that there is no legal power which can compel any accused person to submit his or her body for examination, the possible consequences of which might be the discovery of facts which would probably be used against him as evidence at his trial. By keeping these facts in mind, a medical witness

may avoid, on the one hand, a criminal action for assault, or, as it is termed in England, assault and battery, and, on the other hand, a civil action for damages. It is not enough, we believe, that the person to be examined offers no resistance or objection; for that may be determined solely by ignorance of his or her rights: it is necessary, just as in the foregoing case respecting speech, that the person should be cautioned as to the probable effects of the examination. The course which we pursue is the following: To say to the accused in the presence of a third party, who acts as a witness, that we have been asked by the authorities to examine him or her, but that we can only do so after obtaining consent which he or she has a right to give or withhold, and that we will be bound to report the results of our examination whatever they may be. Should the consent be refused, then our simple duty is to report that we proceeded to make the necessary examination, but that consent was refused. Should, however, consent be given, we may then proceed to make the necessary examination, being protected by the corroboratory evidence of the witness.

In the Police Orders to the Metropolitan Police, under the heading of "Medical Examination of Prisoners," the following explicit instructions are laid down, which we summarise:—

I. It is expedient that a medical examination of prisoners charged with rape, or any offences under the Criminal Law Amendment Act, 1885, should be made, and inspectors of police must see that such is made where the *prisoner consents.*

II. If the prisoner consents, he is to be told that he is entitled to have present on his behalf a medical man, and if he desires such attendance, then the examination shall only be made under these circumstances by arrangement.

III. An entry is to be made and signed by the inspector of police at the time of every such proposal for a medical examination, and of the fact of consent or refusal by the prisoner in his presence, also of the offer to the prisoner of medical attendance on his own behalf, and whether the prisoner accepts or rejects the offer—all of which entry shall be read over to the prisoner.

IV. If an examination be made, and the prisoner be committed for trial, the inspector of police must attend the trial, and have the entry with him to prove consent, if necessary.

V. The divisional surgeon, who is charged with the duty of making said examination for the police, must make a separate entry in his private memorandum-book of the results of said examination, and he must be informed when and where he shall be required to give evidence before the magistrate.

VI. Where a prisoner is in custody on any charge in which a personal medical examination may be material to him—except in the fore-mentioned crimes—and if he or his friends expressly desire that such should be made, it must be done by the divisional surgeon, or if by another qualified

medical man, in the presence of the divisional surgeon; and the fact of the request being made, and of compliance therewith, shall be entered in the Occurrence Book by the officer in charge, who shall thereafter report the facts.

The legal consequences of want of knowledge of, or inattention to, the necessity of obtaining consent may be serious. Two illustrative cases will sufficiently indicate this. In a case tried before Mr. Justice Denman, at Manchester, in 1878, where a woman—the complainant—was accused of abandoning her infant a few hours after its birth, the judge, on the above point, said in his summing of the case "that no medical man may suppose himself armed with authority to proceed contrary to the express will of the person he is instructed to examine." [1] In the other case, Weir and Wife *v.* Hodgson, which was tried at the Liverpool Winter Assizes, in 1861, the defendant, a surgeon, acting on the verbal request of the coroner and an inspector of police, proceeded to examine Mrs. Weir, as to whether or not she had recently been delivered of a child—since the dead body of a child had been found near her house. Although the woman refused to be examined by the defendant, and offered to send for a medical man whom she knew to make the examination, the defendant did examine her in spite of her protestations. The jury returned a verdict for the plaintiff, and assessed damages at £200, which, it is said, ruined the defendant.[2]

Medical practitioners are not infrequently asked by ladies to examine their female domestic servants whom they suspect of being pregnant. Sometimes out of a desire to oblige, medical men have unthinkingly made the required examination, have informed the lady of the result of the examination as confirmatory of her suspicion, and the servant, in consequence, has been dismissed. Such an action is quite contrary to law, inasmuch as, consent not having been expressly given, a technical assault has been committed, and in respect that the practitioner has revealed the servant's secret, he has violated the law of professional secrecy, for which he may be made defendant in an action at law. The safer and legal course to pursue, under these circumstances, is to advise the employer of the girl to frankly tell her servant of her suspicion, and to ask her to consult a medical man of her own choosing, or to offer the girl the services of the family doctor, who then could advise the girl to quit service. In no case should a medical man proceed surreptitiously to examine a girl for such a purpose, by making pretence to examine her heart or lungs, while his intention is only to discover the condition of the mammæ. Should the unfortunate girl, moreover, be under the age of thirteen, even consent would be no defence to an action for indecent assault, in terms of 43 & 44 Vict. c. 45. It will be obvious, besides, that in the relationship of master and servant, employer and employed, medical men must act cautiously, especially where their action may end in the dismissal of the servant or employee on the ground of unfitness through ill-health, since it is so easy to traverse the law of privilege.

[1] *The Lancet*, vol. i. 1878, p. 137.

[2] *Liverpool Medico-Chirurgical Journal*, Jan. 1890; Lowndes on "Medico-Legal Responsibilities."

CHAPTER III.

PERSONAL IDENTITY IN ITS MEDICO-LEGAL BEARINGS.

THE question of personal identity has frequently forced itself upon courts of law: not only in the detection of criminals, where it assumes a routine aspect, but also in the establishment of *bona fides* of the claims of individuals who assert certain legal rights.

Although in many of these cases the question is decided without the aid of the medical jurist, there are, at the same time, certain of them in which his assistance is sure to be invoked, and in which his services are likely to be valuable. In such cases the medical jurist is asked to advise as to the presence or absence of bodily defects, the presence or absence of bodily markings, such as scars, tattoo marks, or other marks due to heredity, accident, surgical treatment, or the effects of disease; or to determine, in cases of doubtful sex or hermaphroditism, to which sex the person actually belongs; or, in other cases, to pronounce an opinion relative to the physiological results of the natural growth of the body, or to the effects of time, the accidents of life, or of climate, occupation, or of mental shock in altering the personal appearance or impairing the mind or memory of a person; or in like contingencies. This subject may, therefore, be divided into two parts, viz.:—

(A) Identity for Criminal Purposes;
(B) Identity for Civil Purposes.

A. Identity for Criminal Purposes.—For the purpose of detecting criminals, the establishment of identity is of considerable importance. Up till a few years ago, in our law courts, previous convictions for crime were proved in open court against a prisoner, and were deemed to be an aggravation of the offence for which the prisoner was undergoing trial. In order to prove these convictions, identity of the prisoner had to be established by personal recognition on the sworn testimony of criminal officers, who, not infrequently, had to detect the criminal from under a cloud of *aliases*, and whose means of identifying were very often solely confined to their memories, which, although remarkable, could not be considered infallible. By the Act 50 & 51 Vict. cap. 35, such previous convictions are not now put before a jury, on the ground that they are apt to bias the minds of the jury respecting the guilt of the accused of the crime for which he is being tried. They are, however, placed in the hands of the judge, who may, after conviction, reflect them in the kind and severity of the sentence which he pronounces. Formerly and, to some extent, even now, the identity of criminals was accomplished in this country by means of written descriptions, with respect, among other things, to bodily defects and markings, along

with photographs. A glance, however, over a few pages of a criminal "album" will suffice to show how valueless the latter were for the purpose, since the knowing criminal had only to throw his features into some grotesque shape to vitiate the intended result, which was, moreover, commonly done. It could not, therefore, be pretended that these means were scientific.

ANTHROPOMETRY.

In foreign countries, on the other hand, and especially in France, the means of identification have gradually been developed, until now they may be said to have reached almost the dignity and accuracy of an exact science under the title of Anthropometry. Since the principles of anthropometry have now found a footing in this country, and are likely to become more extended for criminal purposes, it is necessary that medical men, who may occupy official positions in criminal prisons, should be acquainted with them. In the year 1894 the Secretary of State for the Home Department appointed a Committee to consider the best means for establishing identity in the detection of criminals, which Committee issued a report in the same year, in the form of a Blue-book, with the title, "Report of Committee appointed by the Secretary of State to Inquire into the best Means available for Identifying Habitual Criminals." After considering the means then in use, the Committee gave special attention to the methods of Bertillon and Galton, which, with the addition of other means, they recommended to be adopted in this country.

The Bertillon system of identification, or, as it is called in France, "Bertillonage," from the surname of its inventor, M. Alphonse Bertillon, was decreed to be used in the French penal service in 1882, came practically into operation in 1890, has since been extended to various countries of the continents of Europe and America, and is now in use, in a modified way, in Great Britain and Ireland, combined with the Finger-print system. Bertillon claims great accuracy for his method if it be faithfully followed. The system is that a record is taken of certain bodily measurements of each person, which measurements are noted upon cards which are kept in a specially arranged cabinet in the Bureau of Identification. The following are the measurements which are made:—

I. Height of person.
II. Span of outstretched arms.
III. Height of trunk (person sitting).
IV. Length of head.
V. Width of head.
VI. Length of right ear.
VII. Width of right ear.[1]
VIII. Length of left foot.
IX. Length of left middle finger.
X. Length of left little finger.
XI. Length of left forearm and hand, or cubit.
XII. Colour of the iris or irides.

The five measurements which constitute the basis of *primary classification* are these, viz.:—

I. Length of head.
II. Width of head.
III. Length of left middle finger.
IV. Length of left foot.
V. Length of left forearm.

They are selected because (1), they are the most constant in each adult person; (2), they are the most varied in different persons; (3), they are the

[1] Bertillon has now substituted for this measurement that of the *breadth of the face* between the outer surfaces of the zygomatic arches.

[illegible]

la Vide "[illegible] Instructions" – American [illegible] 1870

least correlated to one another; and (4), they are the easiest for accurate measurement.

The mode of classification, which is, perhaps, the most admirable part of the system, is as follows:—

Bertillon starts from the assumption that he has to classify in one cabinet the recorded measurements put upon cards of 90,000—or any total figure divisible by three—male or female prisoners.

First, this total of 90,000 is divided into three classes of 30,000 each, according as the head is *long*, *medium*, or *short*. He reckons as *short* heads those which measure 184 millimetres or under; as *medium* heads, those from 185–190 millimetres; and as *long* heads, those from 191 millimetres and upwards.

Second, each class of 30,000 is again subdivided into three classes of about 10,000 each, according to the *width of the head*. Thus in the division for *long heads*, the limits of *medium width* are 155–159 millimetres; in the division for

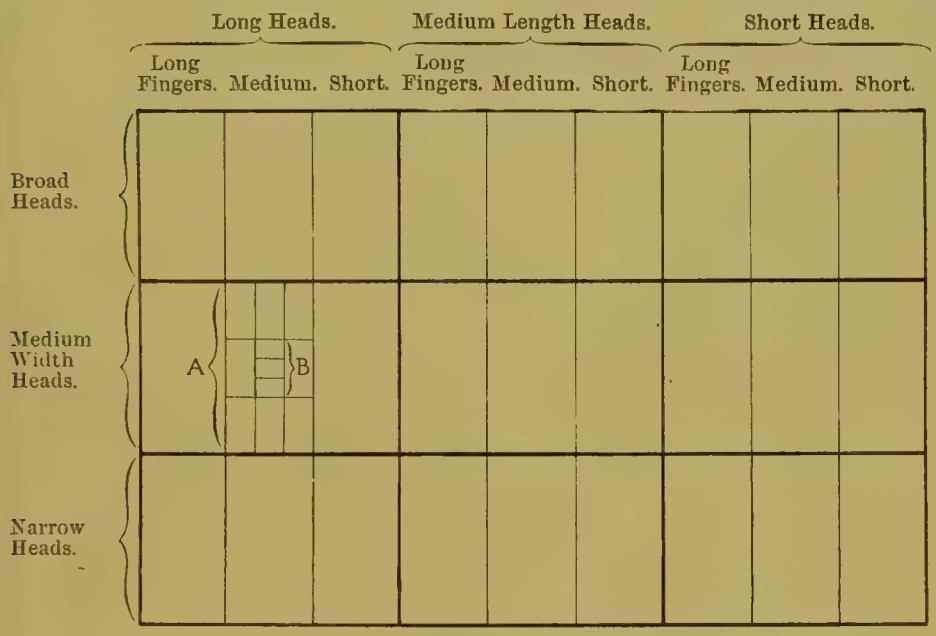

FIG. 1.—Plan of Bertillon's Cabinet for Classifying Identification Cards of Anthropometric System.

At A, each division is divided into three subdivisions by Length of Foot, Short, Medium, Long, from below upwards. Then each group is subdivided by Length of Forearm, at B, into Long, Medium, Short, from above downwards. In all, therefore, there are 243 compartments in the Cabinet.

medium long heads, 154–158 millimetres; and in the division for *short heads*, 153–157 millimetres. The other measurements for these groups being similarly adjusted.

Third, each class of 10,000 is again subdivided into three classes of about 3300 each, according to the *length of the middle finger*.

Fourth, each class of 3300 is further subdivided into three classes of about 1100 each by the *length of the left foot*; and

Fifth, each class of 1100 into three classes by the *length of the left forearm and hand or cubit*.

Thus starting with 90,000 persons, and using each of the five primary measurements for the purpose of tripartite division, 243 separate classes are formed, each of which contains approximately the record-cards of about 400 persons. But this number is too large for accurate and rapid identification, hence a plan of *secondary classification* had to be adopted, viz.:—

Sixth, each class of 400 is then still further subdivided into three groups of about 140 each by the *height of the person*;

Seventh, each group of 140, into three smaller groups of unequal numbers by the *length of the left little finger;* and

Eighth, each group of about forty-five is still further broken up by the *colour of the iris or irides*, and as Bertillon recognises seven colours, the number in each ultimate separate group varies from three or four up to fifteen or twenty. In this way, therefore, a total of 90,000 is ultimately subdivided into small groups composed of these numbers.

For sorting out or classifying the measurement cards, Bertillon has devised a special cabinet, Fig. 1. The cabinet is primarily divided into *three vertical divisions* by two partitions, for *long*, *medium long*, and *short* heads. By two horizontal partitions, these are divided each into *three* sections, for *broad*, *medium*, and *narrow* heads. Again, by two vertical partitions, each of these is divided into three smaller sections for *long*, *medium*, and *short left middle fingers:* thus making in all twenty-seven sections. Each of these sections is divided horizontally to form three shelves for the *length* of the *left foot;* the *upper* shelf containing the *long*, the *middle* shelf, the *medium*, and the *lower*, the *short* feet. Then each shelf is divided into three compartments for the *length* of the *left cubit*, the *upper* compartment containing the *long*, the *middle*, the *medium*, and the *lower*, the *short* forearms. There are now in the cabinet 243 apartments or divisions, each of which contains one class of cards numbering approximately 400. Hence, when the five primary measurements, already named, of any prisoner have been correctly taken, the apartment, or division, or drawer in which his card will be found will be indicated by his remeasurement, should he give an *alias* instead of his proper name and surname.

In addition to these measurements, all scars or other marks upon the body are noted, with reference to (*a*) their nature; (*b*) form; (*c*) size; (*d*) direction; and (*e*) exact anatomical position.

Modus Operandi of the System in Paris.—All prisoners arrested daily in Paris and in the department of the Seine on any criminal charge, are brought every morning to the Depôt of the Prefecture of Police, whence they are passed on to M. Bertillon's Bureau for measurement. Each prisoner is asked if, on any previous occasion, he has been measured. If he answers affirmatively and gives his name, then his identification card and criminal history are quickly forthcoming after a glance at the alphabetical register. If, however, he replies in the negative, and untruthfully, his measurements and description are then fully taken. Then by comparing his five primary measurements with those similar in the cabinet—since the particular group is quickly found—it is not difficult to pick out his card, confront him with his own photograph, perhaps, and recite his whole previous criminal record. If his reply be truthful, then his card is grouped in its proper place against future need.

Tests of Value of the System.—There are two ways by which the value of the method may be tested, viz.—(1) by the number of mistakes of identification which are made; (2) by the number of failures to identify. Bertillon claims that of all the identifications made by his office during the past eleven years, not a single one has proved wrong; and respecting the failures to identify, that while there were four in 1890, and six in 1891, there were none in 1892. The reader may pursue the subject further in the following works: *Instructions Signaletiques*, 1893, of which there was an American edition published in 1896, *L'Anthropometric Judiciare à Paris en* 1889, and *La Photographie Judiciare*, 1890.

FINGER-PRINT METHOD.

The other method by which identification of criminals may be scientifically secured, is the Galton, or Finger-Print Method. Although this method was probably first used practically by Sir William Herschell, of the Indian Civil Service, for the purpose of identifying natives on account of the prevalence of personation in the law-courts, the credit of first making an attempt to work the impressions into a classified system must be accorded to Francis Galton, who, in 1892, published his work on the subject.[1]

The essential features of this system are the impressions which are taken from the bulbs of the fingers and thumbs. It is well known that the skin in

[1] "Finger-Prints," 1892.

these situations is thrown into ridges and hollows of various patterns, from which impressions may be taken on paper or cardboard, by means of printers' ink, which prints can be delineated by the aid of a hand-lens, or may be enlarged by photographic processes. These markings maintain their individual peculiarities in each person from infancy to old age, and, with probable exceptions, in which habitual friction or pressure, or wounds with resultant scars may affect their integrity, they also retain their definition and singularity. Galton has reckoned, owing to the individuality of the markings, that the chance of two prints being identical in individuals is less than one in sixty-four thousand millions, a figure which, roughly, is four times the population of the known world.

The patterns found on the bulbs of the digits divide themselves into three main types—the basis of Galton's scheme of classification—viz., (*a*), the arch; (*b*), the loop; and (*c*), the whorl.

In constructing the finger-print formula, Galton takes the impressions of the ten fingers in the following order, viz., (1), the first, second, and third fingers of the right hand; (2), the like fingers of the left hand; (3), the thumb and little finger of the right hand; and (4), the same fingers of the left hand. The impressions are then translated into a formula of letters, based as follows:—

a	stands for	*arch* type;
l	do.	*loop* type;
w	do.	*whorl* type;
r	do.	loops coming from *radial* side;
u	do.	loops coming from *ulnar* side.

A typical formula—indeed, that of Galton himself—may read like the following: *wll, wll; wl, wl.* The manner of formulæ possible from this method of classification has been calculated to amount to 104,976; hence there would be as little difficulty in applying the principle to 100,000 prints as to 100,000 or 90,000 measurement records.

Objections which have been offered to the Finger-Print System.—These may be summarised as follows: *First,* that the markings might be accidentally or intentionally altered or removed. Observation of large series of very different cases has demonstrated, however, that they could not be so altered as to cause misidentification, although they might be removed of set purpose, or by accident; but the resulting scar or deformity which would result would thereupon of itself become a distinguishing mark of identity. *Second,* they might be obscured or partially obliterated in the digits of manual labourers by friction or pressure, or both, especially in such employments as those in which rough materials are being more or less constantly grasped by the fingers, as in brick-laying, building, etc. While this is true in some measure, the extent of obliteration is not such as would altogether destroy the effectiveness of the resulting prints. From this point of view, the objection loses force when it is remembered that the habitual criminal is about the last person to engage in such manual labour as would seriously affect his finger-tips. *Third,* that such formulæ are too complicated, and the method of taking the imprints too difficult, for the ordinary prison official. Whatever value lies in this objection can only be ascertained by putting the system into experimental use, when the opposite has been shown. *Fourth,* that such finger-prints could not be used in courts of law. This objection is of no value, since, like ordinary photographs, skiagraphs, drawings, etc., after their accuracy and truthfulness have been sworn to, they may become productions in a case, and therefore admissible as evidence.

The British Committee in their Report discussed the merits of both systems. Of Bertillon's method they declared their opinion that its method of classification was the strongest point in its favour. Provided that it could be ensured that the measurements in every case were properly taken and correctly recorded, they believed that the identity of a criminal who had previously been measured would be as rapidly effected, and as easily, as finding an accurately spelled word in a dictionary. Of the Finger-Print system they were "clearly of opinion that for the purpose of proving identity, the finger-prints examined and compared by an expert furnish a method far more certain than any other. . . . Considered merely as a test of identity and not as a detective agency . . . their use

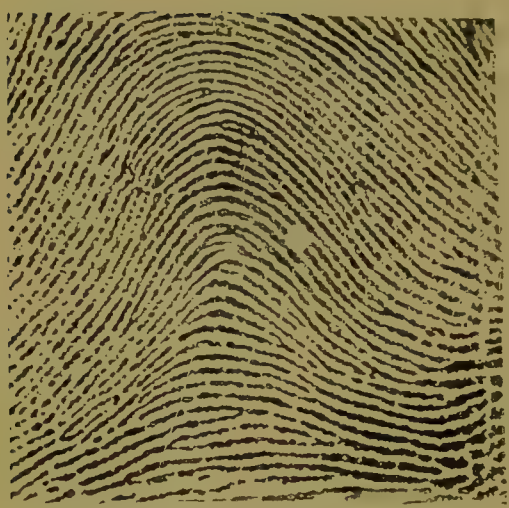

FIG. 2 illustrates the *Arch* type of impression, in which the ridges run from side to side without turning backward. (Henry.)

By permission of Mr. Henry.

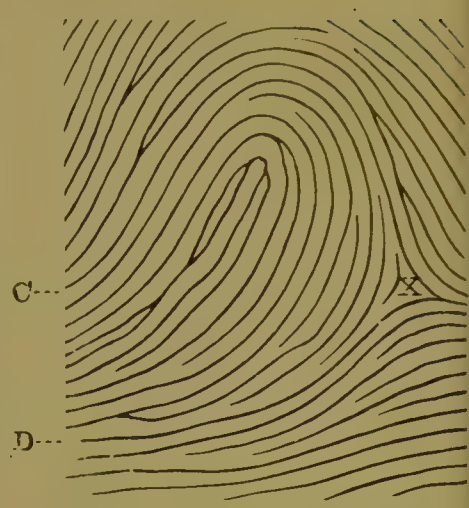

FIG. 3 represents a *Loop*. In this type, the ridges may take a backward turn, but do not twist. In the figure, the ridge AX bifurcates into the ridges XC and XD. The loops run towards the left. (Henry.)

FIG. 4 is a diagrammatic drawing of a Whorl impression; a whorl being an impression in which some of the ridges turn through a complete circle. The ridge AY divides into the ridges YB and YC, and the ridge DZ into the ridges ZE and ZF, leaving in the centre of the impression a series of more or less circular ridges. (Henry.)

FIG. 5. — Actual Impressions of Digits, to i trate Types of Patterns. The uppermost show a plain and rolled impression of a L the middle pair, of an Arch; and the lower pair, of a Whorl. (Taken by Author.)

becomes at once extremely simple, and in the hand of an expert free from any danger of error."

It is obvious that the efficacy of the Finger-Print system must mainly depend upon the mode of classification adopted. What seems to have been lacking in Galton's mode of classification has been supplied by the system adopted in India.

Henry,[1] in his most interesting work on this subject which was prepared by order of the Government of India, divides the question of identification by this method into two parts, viz.: (1) the definitions by which the finger impressions may be described with accuracy, and by which dissimilarity of impressions may be shown; and (2) the system of classification by which the finger impressions taken may be grouped. In India, where so many natives are unable to read or write, and where identity from general likeness is more difficult on account of their colour, the system of finger-prints has come largely into vogue to prevent fraudulency. Moreover, by Act V. of 1899 (India Council), the law of evidence was amended so as to admit, as relevant testimony in Indian law-courts, the evidence of finger-print experts.

FIG. 6.—A Lateral Pocket Loop impression. This is formed when the ridges of a loop bend suddenly downwards on one side before making the backward turn, and leave an interspace or pocket which is filled by ridges of another loop. (Henry.)

Henry divides all finger-tip impressions into four types, viz.: (a) *arches;* (b) *loops;* (c) *whorls;* (d) *composites.* In the *arch* type the epidermal ridges pass from one side to the other without making any backward turn; in the *loop* type, some of the ridges make a backward turn, but without any twist; and since in the impressions the downward slope may be toward the ulnar or radial side, loops are designated *ulnar* or *radial;* in the *whorl* type, some of the ridges make a turn through at least one complete circle; and in the *composite* class

FIG. 7 represents a deviation from the normal loop in which the ridges near the core differ in their course from those surrounding them. It is, therefore, called a Central Pocket Loop. (Henry.)

[1] "Classifications and Uses of Finger-Prints," 1900.

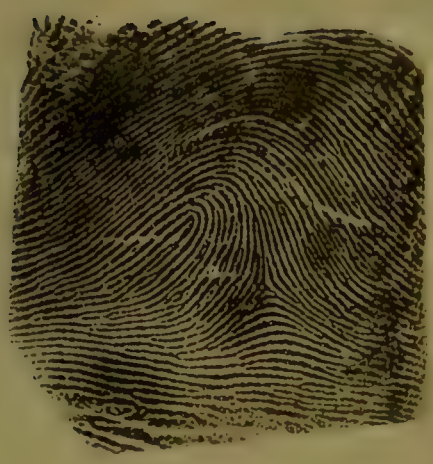

FIG. 8.—Rolled Impression of Imprint of Loop (about double normal size), taken by the author. If of the Right Hand, it would be a radial loop; if of the Left Hand, an ulnar loop.

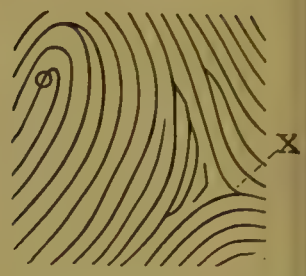

FIG. 10.—To illustrate *fixed* points in impressions. The small circle represents the "point of the core," or the "inner terminus"; X, the "delta" or "outer terminus." In this figure, the bifurcation is formed from the division of a single ridge. Where two or more bifurcations are present, the one nearest the point of the core is taken as the terminus. (Henry.)

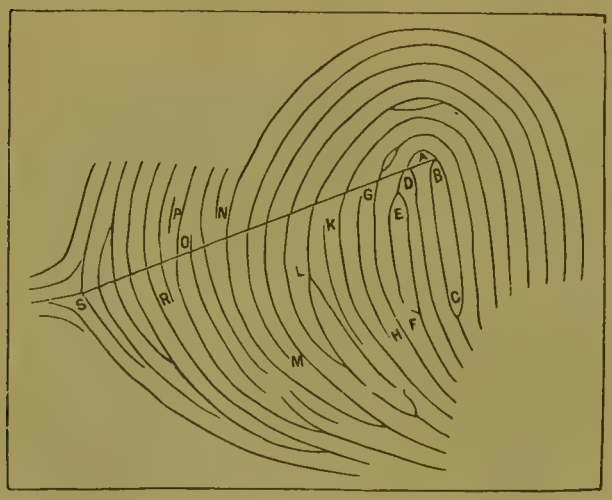

FIG. 9 shows diagrammatically Ridge-Counting, and Ridge-Characteristics. From the core to the outer terminus in the line SB, the number of ridges, excluding the two terminal points, is 17, which figure would be of value in classification. The chief characteristics of this impression are (1) the core, which forms a staple; (2) the islands above A, and to the left of A; and (3) the abrupt ending of ridges, as at G, H, K, and O, and the bifurcations at L and E. (Henry.)

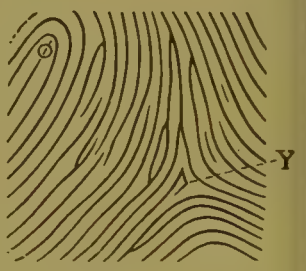

FIG. 11.—Here the circle represents the core, and Y the outer terminus; the rule being that where the upper and lower sides of the delta are formed by the sudden divergence of two ridges which up to the point of divergence have run parallel, the nearest ridge in front of the point of divergence is to be reckoned as the outer terminus, whether it is united or separate. (Henry.)

FIG. 12.—"Plain" Impression of Bulb of Finger. (Henry.)

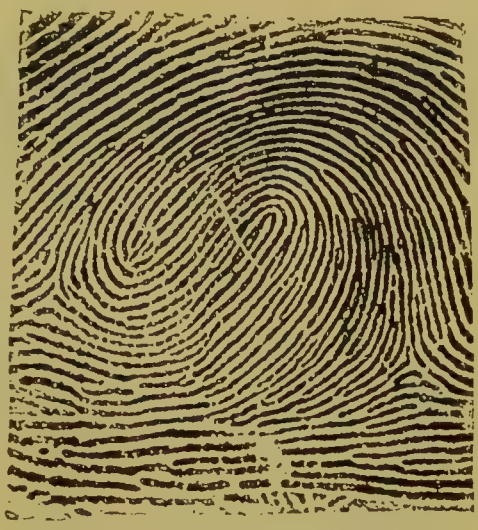

FIG. 13.—"Rolled" Impression of Bulb of Finger. (Henry.)

FIG. 14.—Plain Imprints of Thumb and Fingers of Right Hand of Author; the thumb is lowermost, and the index finger, the first on the left of the Figure. It will be observed that the type of impression in the Index finger is a whorl, and that those of the other digits are ulnar loops.

are included all impressions in which two or more of the above types are found in the impression. This class is subdivided into (*a*) central pocket loops; (*b*) lateral pocket loops; (*c*) twinned loops; and (*d*) accidentals. Of

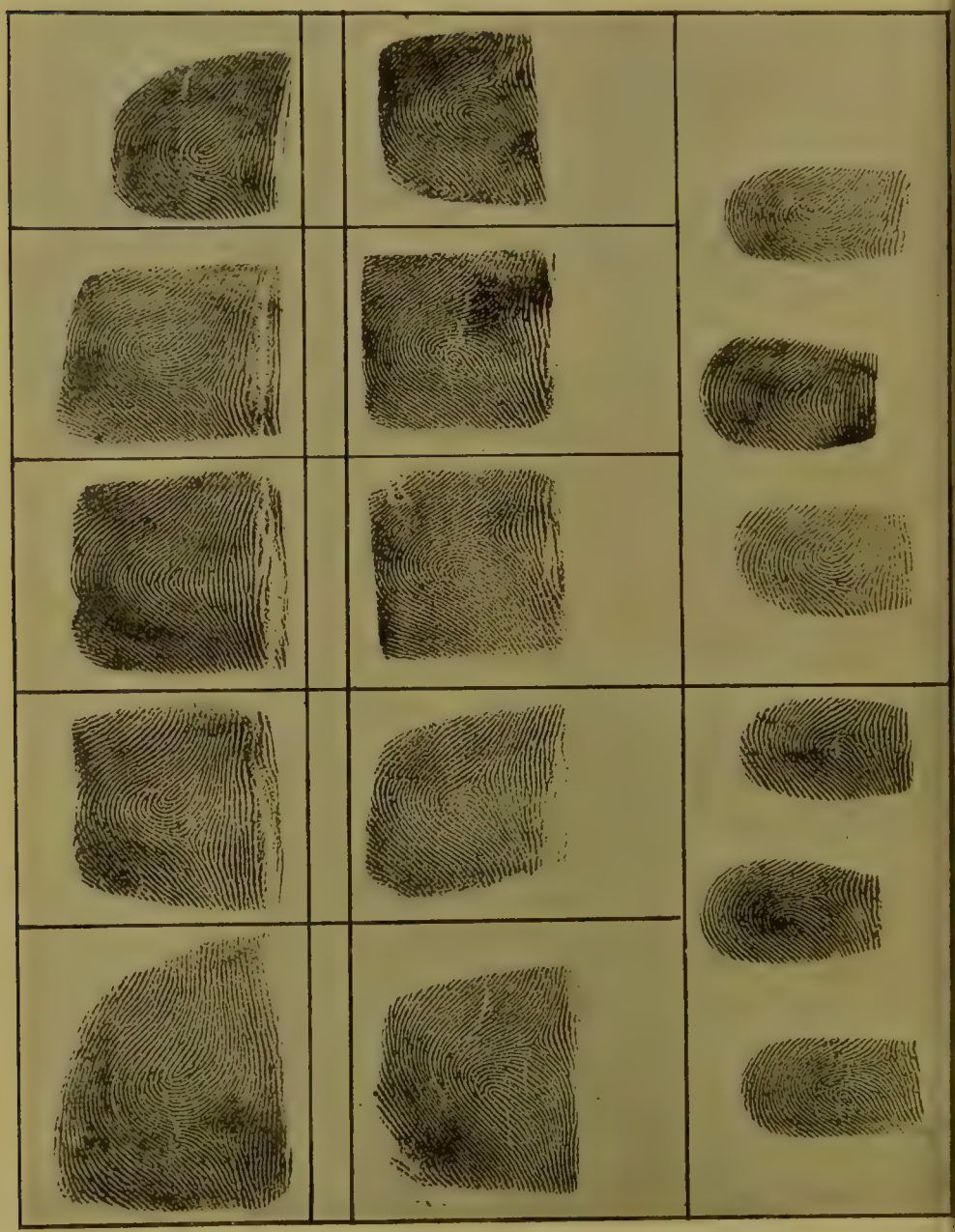

FIG. 15.

Rolled Impressions of Digits of Right Hand—Thumb to Little Finger.

Rolled Impressions of Digits of Left Hand in same order.

Plain Impressions (1) of Left Hand Ring, Middle, and Index Fingers; (2) The same of Right Hand, Index, Middle, and Ring Fingers.

the above types, that of the *loop* is found to largely predominate; indeed, as Henry points out, two out of every three impressions belong to this type. It is

necessary, therefore, to subdivide the loop group not only into ulnar and radial divisions, but also by counting the number of epidermal ridges, omitting the terminal points, between the core of the loop and the nearest "delta," that is, the point where a ridge bifurcates, or where two ridges which have been parallel for some distance suddenly diverge, by noting the ridge characteristics, and by observing the orientation of patterns. The following figure will serve to illustrate the above points :—

The symbols used in this classification are, A = arch ; T = tented arch ; L = loop ; W = whorl ; C = composite ; L P = lateral pocket ; T L = twinned loop ; C P = central pocket ; Ac = accidental ; I T = inner terminus ; O T = outer terminus ; U = \ = ulnar in right hand ; R = / = radial in right hand ; U = / = ulnar in left hand ; R = \ = radial in left hand.

Mode of Primary Classification in Henry's System.—The imprints of the finger bulbs are taken in two different ways, and from the method used are called "*plain*" and "*rolled*" prints. In the former, the impression consists of the imprint of the bulb simply laid down on the impressing surface, and shows mainly the "core" of the pattern ; in the latter, the impression consists of the imprint of the bulb which is rolled from one side to the other, and thus shows the whole imprint of the pattern. In the above classification, the "rolled"

Rolled Impressions of Right Thumb	Index	Middle	Ring	Little
Ulnar Loop \	d.° \	Arch	Ulnar Loop \	d.° \
D.° of Left Thumb	Index	Middle	Ring	Little
Ulnar Loop /	d.° /	d.° /	Central Pocket Loop	Ulnar Loop /
Plain Impressions Ring Middle Index Left Hand		Plain Impressions Index Middle Ring Right Hand		

Key to Fig. 15.

Order of taking Finger-Print Impressions according to Henry's System of Classification. The formula for the above is : $\frac{L}{L} : \frac{L}{L} : \frac{L}{L} : \frac{L}{L} : \frac{L}{L}$ for Primary Classification. But for Secondary Classification, both Index Fingers being Ulnar Loops, the formula would be $\frac{U}{U}$; and since the Right Middle Finger contains an Arch, the formula then becomes $\frac{Ua}{U}$.

impressions of the fingers in their natural order are, viz. : thumb, index, middle, ring, and little finger. Those of the right hand are placed above those of the left. The "plain" impressions of the index, middle, and ring fingers of both hands are taken by means of a guard, which ensures their being taken in this order, and are placed below the others. Both sets being, therefore, on one slip, are read for comparison. The impressions of the fingers are read off in pairs as follows, viz. : *right thumb and right index ; right middle and right ring ; right little finger and left thumb ; left index and left middle ; left ring and left little finger.* It will thus be seen that the construction of the finger-print formula in this system differs very essentially from that in the Galton system. Experience shows that of every hundred average impressions, sixty belong to the loop type,

*

thirty-five to the whorls and composites, and five to the arch type. Therefore, in the primary classification, arches are included among the loops, and composites among the whorls; so that two main divisions are instituted, *loops* and *whorls*. The next step to be taken is to consider the number of arrangements of these two types possible between the right thumb and right index finger. Obviously they are four, viz.: (1) where thumb is a loop and index is a loop; (2) where thumb is a loop and index a whorl; (3) where thumb is a whorl and index a loop; (4) where thumb is a whorl and index a whorl; or, to put in a formula, where thumb is numerator and index finger the denominator:—

$$\frac{L}{L};\ \frac{L}{W};\ \frac{W}{L};\ \frac{W}{W}.$$

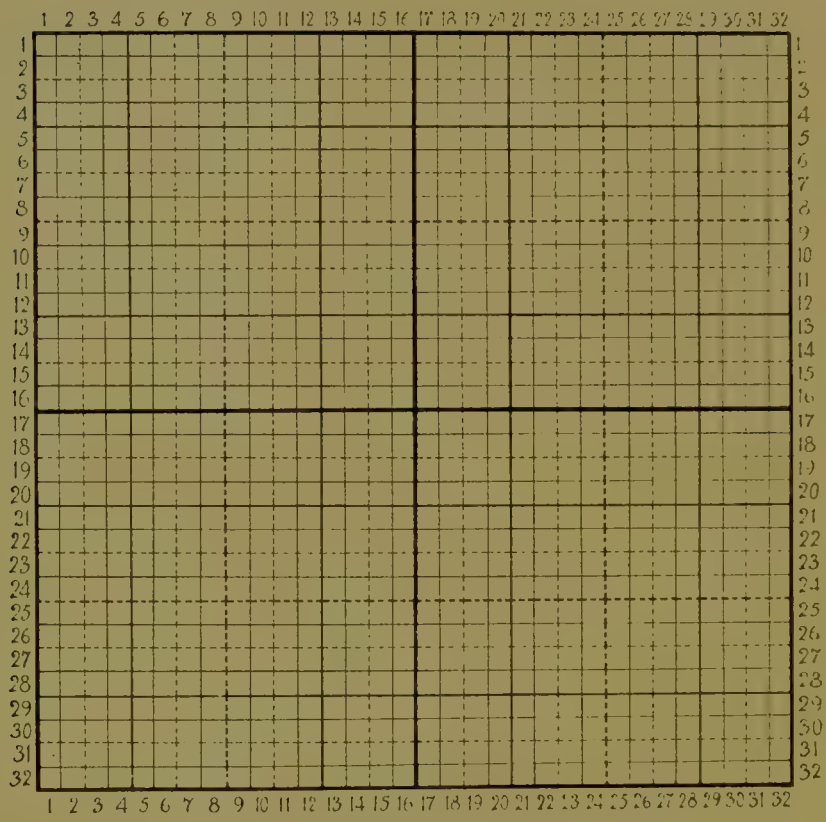

Fig. 16.—Plan of Henry's Cabinet for Classifying Finger-Prints.

If the next pair, viz., right middle and right ring fingers, be taken, there are four possible combinations, which, if combined with the possible combinations of the first pair, and of the pairs taken together, amount in all to sixteen possible combinations. Similarly, with the third pair, sixty-four; with the fourth pair, 256, and with the fifth pair, 1024 total possible combinations. Therefore a cabinet with thirty-two sets of thirty-two pigeon-holes arranged horizontally would accommodate the 1024 possible different combinations.

Explanation of Fig. 16.

The finger-prints of ten digits are taken in pairs in the following order: (1) right thumb and right index; (2) right middle and right ring; (3) right little finger and left thumb; (4) left index and left middle; (5) left ring and

left little. All imprints are divided into two types: I. loops (including arches); II. whorls (including composites). In the above order of pairs, ten digits may have, as pointed out below—the following formula: *LW – WL – LL – WW – LW*, where *L = loop; W = whorl.*

This Key indicates the particular pigeon-hole of the total 1024 of the Cabinet in which a card with the above formula will be found.

LL	LW
WL	WW

FIG. 17.—Key to Henry's Cabinet.

Following the Key, *LW* is in the top right-hand square, defined by the horizontal figures 17–32, and by the vertical figures 1–16. *WL* is in the bottom left of $\frac{17\text{–}32}{1\text{–}16}$ square, defined by the horizontal figures 17–24, and the vertical figures 9–16. *LL* is in the top left corner of this $\frac{17\text{–}24}{9\text{–}16}$ square, defined by the horizontal figures 17–20, and the vertical figures 9–12. *WW* is in the right-hand bottom corner of this $\frac{17\text{–}20}{9\text{–}12}$ square, defined by the horizontal figures 19–20, and the vertical figures 11–12. The last pair *LW* is in the top right-hand corner of this $\frac{19\text{–}20}{11\text{–}12}$ square; that is, in the pigeon-hole $\frac{20}{11}$. Any other combination of impressions can be similarly found.

Besides the above Key, Henry has devised an arithmetical rule for determining this primary classification. The digits being taken in pairs, the first of the pair being taken as numerator and the second as denominator, and the formula found being the following—

$$\frac{L}{W};\quad \frac{W}{L};\quad \frac{L}{L};\quad \frac{W}{W};\quad \frac{L}{W};$$

the rule is applied thus: When a *whorl* occurs in the first pair, it is given the figure value of 16; when in the second pair, 8; when in the third, 4; when in the fourth, 2; and when in the fifth, 1; but no figure value is given to a *loop*. Translated into figures, therefore, the above formula becomes—

$$\frac{0}{16};\quad \frac{8}{0};\quad \frac{0}{0};\quad \frac{2}{2};\quad \frac{0}{1}.$$

By next adding the numerators together, and then the denominators, a fraction is formed, *one* being added to the numerator and denominator respectively. Thus the above becomes $\frac{10}{19} + \frac{1}{1} = \frac{11}{20}$. By inverting this fraction, $\frac{20}{11}$, the pigeon-hole in which the slip with that formula is placed may be found; so that in this case the slip will be found in the twentieth pigeon-hole of the eleventh horizontal row. If the primary classification figure be given, the formula may be constructed. If the number be as before $\frac{20}{11}$—which is the inverted fraction of $\frac{11}{20}$—and remembering the figure values for whorls as they occur in sequence of pairs, and also that the figures in the Cabinet run from 1 to 32 in each horizontal row, the reasoning is as follows: the figure 11 of the numerator is less than 32 by 21, which is equal to 16 + 4 + 1, hence whorls must be absent from the nominators of the first, third, and fifth pairs.

Thus: $\frac{0}{\ }$; ; $\frac{0}{\ }$; ; $\frac{0}{\ }$.

The figure 20 of the denominator is less than 32 by 12, which is equal to 8 + 4; therefore whorls are absent in the denominator of the second and third pairs;

thus: $\frac{0}{\ }$; $\frac{\ }{0}$; $\frac{0}{0}$; ; $\frac{0}{\ }$.

Where whorls are absent loops must take their place. Therefore, by subtracting 1 from each of the numerator and denominator figures, and applying the above facts, the figure formula is constructed

thus: $\frac{0}{16}$; $\frac{8}{0}$; $\frac{0}{0}$; $\frac{2}{2}$; $\frac{0}{1}$ = figure formula.

= $\frac{L}{W}$; $\frac{W}{L}$; $\frac{L}{L}$; $\frac{W}{W}$; $\frac{L}{W}$ = letter formula.

Secondary Classification.—This becomes necessary when large numbers of filed imprints accumulate under certain file headings. It becomes necessary for rapid search, therefore, to subdivide these large groups into smaller. Keeping in mind that the imprints of the digits are taken in their natural sequence, and that those of the right hand are placed immediately above the corresponding digits of the left hand, the method of secondary or sub-classification is as follows: The *index finger* of each hand is taken as a fulcrum, and the formula-letter given to it is the capital letter of its symbol, that of the thumb is the small letter of its symbol which is placed to the *left* of the *fulcrum*, while those of the other digits are the small letters of their respective symbols and are placed to the *right* of the *fulcrum*. Those types which are of comparatively infrequent occurrence are taken for the purpose of subdivision, as *Arches*, *Tented Arches*, *radial Loops*. Thus, in the above way, are grouped the classification formulæ of both hands, that of the right hand forming the numerator, and that of the left hand the denominator; thus the formula $\frac{1}{1}$ $\frac{a\ A\ r}{r\ R\ a}$ indicates that the slip will be found under classification number $\frac{1}{1}$ in the collection of slips where there is an *Arch* in the *right thumb*, an *Arch* in the *right index finger*, and a *radial Loop* in *one* of the *other digits* of the *right hand*, and where there is a *radial Loop* in the *thumb*, a *radial Loop* in the *index finger*, and an *Arch* in *one* of the *other digits of the left hand.*

The classification number $\frac{1}{1}$ contains the slips the imprints upon which are loops, which include arches, tented arches, and *radial* and *ulnar* loops. Arches with radial and ulnar loops may be found in one or both index fingers in nine combinations. The horizontal letters signify the right index finger, the vertical, the left index finger, and A = arch; R = radial; U = ulnar.

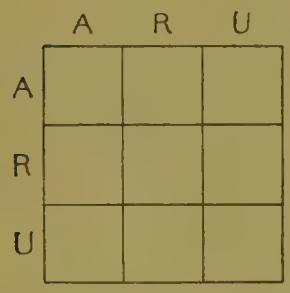

FIG. 18.—A=Arch, R=Radial, U=Ulnar. Showing possible number of combinations.

By extending this principle to the fingers of both hands 256 sub-groups may be formed; but experience has shown that such elaborate subdivision is not called for; it is sufficient to decide whether arches exist in one, two, or three digits to the right of the *fulcrum* or index finger. Therefore the groups formed are: *A; aA; Aa; aAa; A2a; aA2a; A3a; aA3a;* and constitute 64 groups. If the arch be a tented arch, the letter *t* would signify its presence; thus *aAt* would indicate that the arch of the middle finger was a tented arch. In this way the other groups $\frac{A}{R}$; $\frac{R}{A}$; $\frac{R}{R}$, etc., may be also subdivided. When the sub-class $\frac{U}{U}$ is dealt with—that is, where *ulnar* loops are present in both index fingers—it is subdivided into two by the presence or absence of *radial* loops or arches in the other digits. In the former group $\frac{aU}{U}$; $\frac{U}{aU}$; $\frac{Ua}{U}$, etc., which is called the "lettered" group, arches are found; in the latter it is called unlettered, because all the loops are ulnar loops. This unlettered sub-class $\frac{U}{U}$ may be further subdivided by ridge-counting, that is, by enumerating the ridges between the inner and outer terminus of the pattern, but not including these points in the count. Experience has shown that in the index finger the number of prints in which the

number of ridges is between one and nine equals the number of prints in which the number of ridges is ten or more, and in the case of the middle finger, the number with one to ten ridges is equal to that with eleven or more ridges. Sixteen possible groups can be made out of these. In each of these sixteen groups the subdivision is made by the fact whether the number of ridges is high or low. If a count in a print falls near the boundary limit it is readily found, since in each of these groups the slips are arranged according to the number of ridges in the right little finger.

Whorls (including composites) also demand sub-classification, when under a classification number too large a number of slips for rapid search accumulates. This is effected by ridge-tracing. In all whorl type patterns there are two deltas, and depending upon whether the ridge from the one delta *meets* the corresponding ridge from the other or is not separated from it by more than two intervening ridges, or that one delta ridge passes *inside* the other delta ridge with not less than three ridges intervening, or that one delta ridge passes *outside* the other delta ridge with not less than three ridges intervening, the whorl is denominated *M*, or *meeting*, *I*, or *inside*, *O*, or *outside*. The accompanying figures illustrate better than words what is meant.

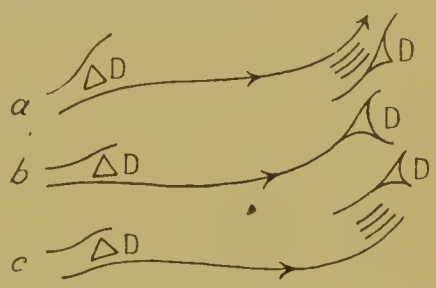

FIG. 19.—*a* = an Inside Whorl; *b* = a Meeting Whorl; *c* = an Outside Whorl; D = Delta of Whorl.

If this be taken as the method of subdivision, and the index and middle finger of the right hand be utilised, each of these may be *I*, *M*, or *O*; consequently the total possible combinations from these factors is nine, and with the corresponding factors for the left hand eighty-one. The following diagram will exhibit the system of subdivision. The horizontal letters represent the right hand, the vertical the left, and the first letter of each pair the index, the last the middle finger.

The full formula for an imprint, in which all the impressions are whorls, would be of any of the above combinations; for example, $\frac{32}{32}\,\frac{OI}{MO}$, or $\frac{32}{32}\,\frac{II}{OM}$, or any other combination, where $\frac{32}{32}$ is the primary, and $\frac{OI}{MO}$ or $\frac{7}{6}$, and $\frac{II}{OM}$ or $\frac{1}{8}$, the secondary classification, numbers. Hence, in figures solely, the foregoing formula would read $\frac{32}{32}\left(\frac{7}{6}\right)$ and $\frac{32}{32}\left(\frac{1}{8}\right)$, respectively.

	II (1)	IM (2)	IO (3)	MI (4)	MM (5)	MO (6)	OI (7)	OM (8)	OO (9)
II (1)									
IM (2)									
IO (3)									
MI (4)									
MM (5)									
MO (6)									
OI (7)									
OM (8)									
OO (9)									

FIG. 20.—Plan for Subdividing Whorl Imprints.

Arrangements must also be made in this system for damaged or missing fingers. The rule for a damaged or absent digit is to take the type of the corresponding digit of the other hand, where that is present; if both be amissing, the impressions are reckoned as whorls, and the formula arranged, calculated, and classified accordingly (*vide* Fig. 26).

The Finger-Print Method, based upon the above system of classification, was determined upon as the scheme of identification of criminals to be used in India,

by a resolution of the Governor-General in Council in June 1897, to supplant the anthropometric system, which had been introduced in March 1892 into the province of Bengal, but which was found to be unreliable, owing, apparently, to faults of measurement believed to be due to the use of automatic measuring appliances. A Committee was appointed in India in March 1897, to inquire into and report upon the Finger-Print system, and because of their favourable report, it was, as stated above, decided to adopt it.

The report of the British Committee bore recommendations in favour of the adoption in Great Britain of the best parts of both Anthropometric and Finger-Print systems, and they advised the following scheme:—

First, To photograph criminals as at present—by means of a mirror—and that a side photograph should be taken which should show distinctly the profile of the face and the form of the ear;

Second, To take the *five* primary measurements of Bertillon's method, in the same way, by the same instruments, and in the metric scale;

Third, To take finger-prints as in Galton's method;

Fourth, To make a written description of each person, noting accurately any and all kinds of distinctive marks in a certain definite order; and

Fifth, That the result of the foregoing investigations be tabulated on a card, including Finger-Print formula and photograph, after the manner of the following:

FIG. 21.—TABULATION CARD.

Head, Length. ,, Width. Left Mid. Finger. Left Forearm. Left Foot.	Name. Number. Date of Birth. Place of ,, Particulars of Conviction.	Finger-Print Formula.
Height . . . . . . Eyes . . . . . . Hair . . . . . . Complexion . . . . . . Distinctive Marks— I II. III. IV. V. VI.	....	Photograph.

System in Practical Operation in Great Britain and Ireland.

The necessary information has been provided by Dr. Garson, Government Adviser and Instructor on the Metric System of Identification.[1] The system is carried out in the prisons of England and Wales, of which there are sixty in number, by male and female warders, who have undergone a special training under Dr. Garson to befit them for the work. The test of efficiency which must be exhibited by each official before being considered fit for this duty is to examine, measure, and arrange the data of eighteen prisoners, so that in the whole number of examinations there may not be more than eighteen errors. Any measurement in the head length and breadth, the face-breadth, and finger-length, more than one millimetre out, in the length of cubit and foot more than three millimetres out, and in the height of the person more than half an inch out, is reckoned as an error. Before, however, he is allowed to make measurements in his prison for permanent record, even after passing the foregoing test, he must perfect himself by practice, and then be set to work along with a more experienced official. Such absolute accuracy is a *sine quâ non* of the system, which depends upon accuracy of measurement for accurate classification.

Measurements taken in Great Britain.—These consist of the following, viz.: (1), *Length of head*, from notch at root of nose to the most prominent part of back of head, whether in the median line or not; (2), *Breadth of head*, wherever it is greatest, but not including outer surface of mastoid processes; (3), *Breadth of face*, between outer surfaces of zygomatic arches where greatest (Bertillon has substituted this measurement for the width of the ear, which he originally took); (4), *Length of left middle finger*, measured with finger bent at right angles to *metacarpus*; (5), *Length of left forearm* or *cubit*, measured from extremity of olecranon, the forearm being bent at elbow, to the distal extremity of middle finger; (6), *Length of left foot*, taken while person stands with whole weight of body resting on that foot only, the knee-joint being bent forward; (7), *Height of person* when standing erect.

Other and Additional Data.—(1) Photographs of person, one-seventh of natural size, including (*a*), full-face view, and (*b*), profile face view; (2) Scars or marks upon body; particulars noted of these being (*a*), nature of scar or mark; (*b*), form; (*c*), size; (*d*), direction; (*e*), exact anatomical position; abbreviation of terms being used in description thereof. Thus, after examination of a mark on face and neck—the other parts of the body plotted out being, left arm and hand, right arm and hand, chest, and rest of body which includes only the most marked appearances on abdomen and lower limbs—this apparently cryptographic sentence, *Nv hairy cir of* 1·0 *at* 3· *ab i pt l eb* may be formed which reads, *Naevus or hairy mole circular of* 1 *centimetre in diameter at* 3 *centimetres above internal point of left eyebrow.* A table of abbreviations is given. (3) Finger-Prints of the impressions of the digits of both hands. A double set of prints is taken of the digits of each hand—first, "*plain*" impressions, in which the core of the pattern is obtained; and second, "*rolled*" impressions, in which the whole pattern is displayed. But while these are taken, only the "*rolled*" prints of the thumbs and two next digits of each hand are placed upon the identification card, as this has been found sufficient for identification purposes when taken along with the other data.

Metric and other descriptions are taken of the following classes of prisoners, viz.: (*a*), those undergoing a term of penal servitude; (*b*), those undergoing a term of imprisonment, to be followed by police supervision; (*c*), those undergoing imprisonment after conviction on indictment of crime, against whom previous conviction has been proved at the trial.

Manner of Classifying Identification Cards.—This is done in a specially constructed cabinet, as shown in Fig. 22.

Its construction may be followed in the following description. It is divided, *first*, into three divisions by two vertical partitions, shown by the thick lines, each of which contains twenty-seven drawers; *second*, it is further subdivided by two

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[1] "The Metric System of Identification of Criminals, as used in Great Britain and Ireland," Jour. Anthropol. Inst., vol. xxx., 1900, pp. 161–198, with Miscellanea, No. 101.

horizontal partitions, similarly marked, into three subdivisions, each of which contains nine drawers; *third*, each of these three subdivisions is further subdivided by vertical, and then by horizontal partitions, into sets of three drawers each. Up to this point eighty-one drawers have been formed. By subdividing each drawer by two partitions, and thus converting it into three apartments, 243 apartments in all are formed. It will thus be seen that there are five grades of division in the cabinet, each of which is made to bear a definite relation to the first five measurements on the cards of identity. As there is, therefore, a tripartite system of division in the cabinet, so is there tripartite division of each of these five measurements according as each is *large*, *medium*, or *small*. The arrangement of sorting out or classifying the cards of identity is carried out as follows: *First*, all the cards in which the *head length* measurement is *small* are placed in one or other of the twenty-seven drawers of the left vertical third of the cabinet, those in which that measurement is *medium*, into the middle vertical

	Small.			Medium.			Large.			
	Small.	Medium.	Large.	Small.	Medium.	Large.	Small.	Medium.	Large.	
Large.	1	2	3	4	5	6	7	8	9	Large.
	10	11	12	13	14	15	16	17	18	Medium.
	19	20	21	22	23	24	25	26	27	Small.
Medium.	28	29	30	31	32	33	34	35	36	Large.
	37	38	39	40	41	42	43	44	45	Medium.
	46	47	48	49	50	51	52	53	54	Small.
Small.	55	56	57	58	59	60	61	62	63	Large.
	64	65	66	67	68	69	70	71	72	Medium.
	73	74	75	76	77	78	79	80	81	Small.

Fig. 22.—Plan of Cabinet for Classifying Identification Cards in British System.

third, and those in which it is *large* into the right vertical third. *Second*—The next classifying measurement is the *breadth of head*. If this is *small*, it is placed in one of the *lowest* sets of nine drawers; if *medium*, in the *middle* set of nine drawers; and if *large*, in the *uppermost* set of nine drawers. But the limits of *small*, *medium*, and *large head breadth* measurements are fixed in relation to the *head length* measurements; in other words, the *short* or small *heads* are divided into three equal groups according as the *head breadth* measurement is *small*, *medium*, or *large*; the *medium* heads are divided into similar groups, and the *large* heads also into similar groups; since the range of measurements of small, medium, or large head breadth is fixed with relation to whether the head length be small, medium, or large.

We come now to the arrangement in each set of nine drawers. The particular vertical row in which a card is to be placed is determined by the *face breadth measurement*. If that measurement be *small*, it will be placed in the *left hand*

vertical row, if *medium*, in the *middle vertical row*, and if large, in the *right hand vertical row*. The *small*, *medium*, or *large* face breadth measurements bear a definite relationship to the *head breadth*, depending upon whether it be *small*, *medium*, or *large*, and, accordingly, into which set of vertical drawers a particular card is placed depends upon this relationship. Then the *left middle finger* measurement is employed to further subdivide the face breadth groups; and according as it is *small*, *medium*, or *large*, with relation to the *small*, *medium*, or *large* face breadths, is the particular drawer determined into which any individual card is to be placed. Thus, if the finger measurement be *short*, the card is placed in the *lowest drawer of the vertical row of three drawers*, if *medium*, into the *middle drawer of the row*, if *large*, into the *top drawer of the row*. Last of all, the *forearm* and *hand* or *cubit* measurement is utilised to further subdivide these groups. This measurement may be either *short*, *medium*, or *large*. If *short*, the card is finally put in the *front compartment of the drawer*, if *medium*, in the *middle compartment*, and if *large*, in the *back compartment*. Thus it works out that the five measurements provide 243 groups or classes.

For female criminals, who are relatively much smaller in numbers than males, one cabinet of twenty-seven drawers has been found sufficient in size for their classification. For identification of growing adolescent or young adult male prisoners, reliance is chiefly placed upon the finger-prints, owing to the changes, by reason of growth, which are apt to occur in the various measurements.

Dr. Garson has devised a scheme of classifying the finger-prints taken in the British scheme of identification, which is intended to be worked in conjunction with the foregoing metric measurements, and which may be described briefly as follows: He divides the patterns of the bulbs of the digits into three types, viz.:—

1 = *Arches*—signified by the sign = ∧
2 = { *Loops*—which open on the left = ⟋
Loops— ,, ,, right = ⟍
3 = *Whorls*—signified thus = **O**

For this purpose, the patterns on the thumb and three or more of the succeeding fingers of the *right hand* are selected. The *thumb and index finger are always selected*, and when the numbers of cards, consequent upon their use alone, becomes large, the middle finger, or the middle and ring finger imprints are brought into requisition to reduce the numbers of these divisions.

For classification purposes, two types of patterns are first recognised, viz.: (I.) *Arches, including loops;* (II.) *Whorls*. By these markings on the *right thumb*, therefore, two main divisions are created. Each of these divisions is then subdivided into four smaller subdivisions according as the pattern on the *right index finger* is (*a*), an arch; (*b*), a loop opening on the left (or radial); (*c*), a loop opening on the right (or ulnar); (*d*), or, a whorl. Thus eight divisions are formed. Of these eight divisions no further subdivision is necessary in six cases, viz.: In (I.), *a*, *b*, and *d* divisions, and in (II.), *a*, *b*, and *c* divisions. In the case of *c* of division I.—that is, where there is an arch, or either form of loop on the right thumb, and an ulnar loop on the right index finger—subdivision is made further into two classes depending upon whether (*a*), there are *ulnar loops* on each of the four fingers, or (*b*), any combination of pattern in these fingers other than ulnar loops exists. In the case of *d* of division II.—that is, where a *whorl* exists on the right thumb and right index finger—subdivision is made further by the type of pattern of the right middle finger, viz.: (*a*) those in which that pattern is a whorl, and (*b*), those in which it is any pattern other than a whorl.

From these subdivisions, then, *ten* groups of nearly equal size are formed, except that *a* group of division II. is the smallest. Garson equalises this with the others in point of numbers, by putting into it those cases in which one or more of the first four digits of the right hand has been damaged or is amissing, so that the imprint is indecipherable or unobtainable.

By the combination, therefore, of the tripartite classification of five metric measurements which gives 243 divisions, and of the finger-prints of the first four digits of the right hand, which gives ten divisions, no fewer than 2430 divisions are formed, from any one of which, by reason of the smallness and equality of numbers in each, search for any particular identity-card is easy and rapid.

Apparatus used:—

A. For Metric measurements:—

(*a*) Two callipers, or sliding compasses, for measurement of head and limbs.

(*b*) A 30-centimetre rule for measurement of marks.

(*c*) A standard rule and set square for height measurement.

(*d*) The furniture for a measuring room consists of (1) a stool, upon which the foot is rested while being measured, and which is used as a seat while head measurements are taken, and (2) a trestle table upon which the forearm is rested while the cubit measurement is made.

B. For Photography: The usual outfit of good stand camera, etc.

C. For Finger-prints:—

(*a*) A piece of flat sheet tin, or better, of polished copper, about 25 centimetres square.

(*b*) A printer's hand-roller, 15 centimetres long.

(*c*) Printer's ink.

(*d*) A good reading-glass for slight magnification of prints, when being deciphered.

(*e*) Teasing-needles, as used for microscopic sections, to act as pointers in ridge-counting or ridge-tracing.

(*f*) Ordinary white paper, not too highly glazed.

Note.—It is all-important, to secure good clean prints, that ink, copper plate, and roller should be preserved scrupulously free of dust.

A word or two must be said about the kind of callipers or sliding compasses to be used. The Bertillon instrument is of the compass pattern with the free ends curved, the measurement being made by the lines engraved on the arc of a circle which is attached to one of the compass limbs about midway between its extremities. The intervals of measurement are, therefore, graded by their position on the arc; in other words, the distance named one millimetre is not in reality one millimetre but *represents* that distance in the movement of the free ends of the instrument. Thus, unless great care be exercised, errors of reading are apt to arise by reason of the smallness of the intervals. During the time the anthropometric system obtained in India automatic instruments were used, the pressure of which was kept constant by a spring along with a self-registering index. One of the chief reasons on account of which the system was abandoned was the unreliability of the measurements thus taken, due, it was believed, to the inaccuracy of action of the instruments. In the English system Garson has designed an instrument, figured here, by which the millimetric number recorded on the scale is the actual measurement in millimetres; in other words, the distances marked as millimetres are *true* millimetres. It has been in use for about seven years, has given every satisfaction, and, moreover, is calculated to effect more accurate measurement.

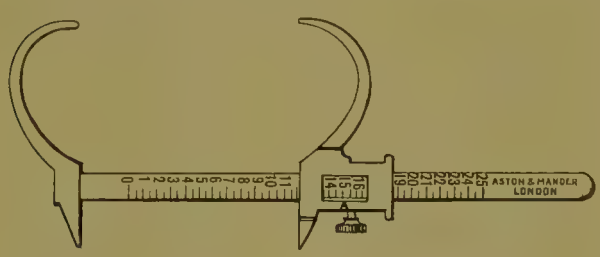


FIG. 23.—Garson's Craniometer or Callipers.

From the foregoing accounts of the different methods employed in different parts of the world, it will be apparent that there is not common agreement as to what constitutes the *best* system. Those who are in favour, after examination of the anthropometric and finger-print systems, of the latter, as the Indian Committee, point out the following advantages of that system over that of metric measurement, viz.:—

I. The apparatus required is inexpensive and easily procured, whereas that of the other is costly and liable to get out of order.

II. It is easily learned, and, therefore, it is easily taught to uneducated persons; whereas the other needs some measure of education on the part of those taught.

III. The finger-impressions record themselves. Moreover, wrong sequence of imprinting of the fingers may be prevented by a metal guard or

mitten; whereas the other requires accurate measurement, accurate reading and recording of measurements, and is, therefore, more liable to the errors of the "personal equation," which, if once recorded, cannot be rectified.

IV. It takes little time; whereas the other requires much time, since, to ensure accuracy, the mean of each measurement taken *three* times is held to be the actual result.

V. No record of bodily markings need be taken, hence the examinee is not required to divest himself of his clothing; whereas in the other such is necessary, as the marks are valuable auxiliary aids to identification.

VI. No allowance for error of the operator is made or needed; whereas in the other a margin of error must always be allowed for each of the measurements, especially where a measurement falls near the boundary limit. Duplicate or even triplicate searches are necessary, upon occasion, in both systems, but they are relatively very much more seldom called for in the Finger-Print system.

VII. The system of search is easy; whereas in the other it must be carried out according to the somewhat complicated key of the system. Rapidity of search in either system will, obviously, depend upon the familiarity of the searcher with his system.

VIII. The system of classification being the all-important matter in both schemes, there is not much to choose between the *primary classification* of the metric system and that of the Finger-Print system, except that whereas in the former only 243 groups, in the latter 1024 groups, are formed, and in Henry's system they can be increased beyond that figure.

A. Identity for Civil Purposes.—This aspect of the subject of identification may be illustrated on general lines by the Tichborne case, which occupied nearly two years in hearing. The leading features of the case were these: A man came forward making a claim to be the heir to the Tichborne estates. The real heir was supposed to have been lost at sea off the coast of South America in 1854, in the wreck of the ship *Bella*. There were certain outstanding events in the life-history of the true heir which were likely never to be forgotten by any ordinary person. The claimant, on being questioned regarding them, seemed to have no acquaintance at all, or, at most, but a very imperfect acquaintance with them. The real heir was known not only to have studied in France, but to be able to converse fluently in French; the claimant, on the other hand, had practically no knowledge of the language. In short, it became apparent as the trial proceeded that the memory of the claimant was in just the condition of that of a person who had never experienced personally the events which formed the subjects of his examination, and that the knowledge which he did possess of them had been obtained through the agency of others, by whom, moreover, he had been but imperfectly coached. The question of personal identity, however, in its medico-legal bearings, depended in some measure upon the presence, or absence, and character of certain bodily markings, such as scars and tattoo-marks. With reference to the former, the real heir was known to have had a scar on the left shoulder caused by an issue which had been kept open for three years; the claimant had also a scar in this situation, but one which was evidently due, from the amount of tissue destruction, to vaccination, and not to the effects of an issue of such long standing, With respect to tattoo-marks, there were none on the body of the claimant, and in his

evidence, he swore that he had never been tattooed. It was proved, on the other hand, by old family friends of the real heir, that on the body of the real heir there were certain definite devices due to tattooing, viz.: On the left forearm, a cross, a heart, and an anchor, with the initials, R.C.T.; and in addition, there was a blotch of tattooing near the wrist. On this point the Lord Chief Justice said that it was "a piece of evidence which is of the last and most vital importance." In another case in 1834, a man supposed to be Stuart by name, was being tried in a London criminal court on the charge of being an escaped convict. His identity was duly sworn to by the prison officials as the man who had actually escaped. The real Stuart was known to have had a wen or growth on his left hand. The man in custody was not able to call witnesses to declare his true identity.

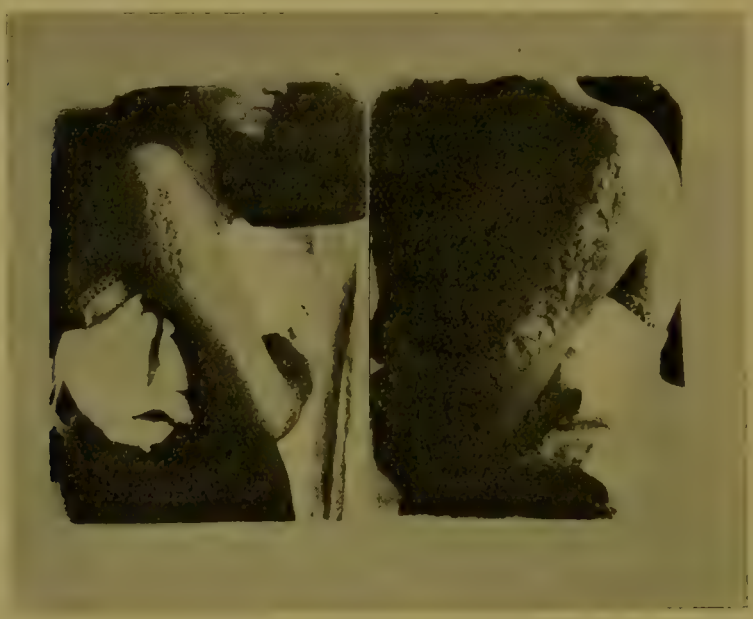


FIG. 24.—Scars of skin of outer aspects of arms caused by self-administration of hypodermic injections of Morphia.

A surgeon—Carfine by name—chanced to be in court, and he begged to be heard as a witness. He gave evidence that if the convict had once had a wen which had been surgically removed, that a scar would be found on the hand, and if prisoner was the man, that a scar would be found on his left hand. The prisoner's hands having been examined, and no scars of any kind found, the court duly acquitted him on the ground that the prosecutor had failed to establish the identity of the prisoner with that of the convict. From the examination, too, of the mutilated remains in the Wainwright murder case, the identity of the body with that of the victim—Harriet Lane—was established by the presence of a scar on one of the lower limbs.

While many other remarkable illustrations might be cited, the foregoing show the bearing and value of such marks with reference to identity.

A. **Scars.**—From these considerations certain important practical questions arise, viz.: Do scars ever completely disappear? The answer to this is: under certain conditions and in certain circumstances they may practically disappear, but that in average circumstances they remain visible. For example, it may be held that scars which result from the healing of wounds in which there has been loss of substance, or from wounds which have healed by granulation, never disappear, but that scars resulting from wounds in which there has practically been no loss of substance may so disappear as to be very difficult to detect. It is sufficient to state these principles for the student to apply them in practice, without condescending upon details. Even in cases, however, in which scars disappear eventually, it must not be understood that they disappear at once; indeed, even in such category of cases, the period of duration will depend upon the original depth of the wound and the amount of tissue destruction: for in surgical wounds, however carefully opposed

FIG. 25.—Scars in Finger-Print. The centre figure is a Plain, and the others are Rolled, Impressions of the same Finger. The scar, which is seen to radiate upwards from the right of the "Core" of the Impression, is the result of a wound produced about forty years ago. (Author.)

the edges may be, there is some loss of substance. Whether, therefore, the scars be the result of breach of continuity of the skin from violence, or from disease in which the tissues of the true skin are involved, they remain permanently. Can scars be removed artificially? The answer to this is: Only by the creation of a new scar. A man might attempt to conceal his identity by effacing a damning scar of a particular kind or shape by overwhelming it in one of larger size. While it is obvious that all that could be gained by such a manœuvre is change of shape, it might, at the same time, to a certain extent cause identification to become more difficult in that particular. Is it possible, from the appearance of a scar, to give an estimate as to the time of the wounding from which the scar has resulted? in other words, Can the age of a scar be approximately arrived at? This is, upon occasion, a question which is asked of the medical witness in order to connect a particular person in custody with a given act in which the perpetrator was known to have been wounded. Here, a witness must proceed with

caution; and his answer must have direct relation to the circumstances of the particular case. The difficulty of giving more than an approximate answer arises from the variable periods which wounds take in healing. Therefore, speaking generally, while a scar at its first formation is of a reddish colour and the skin around it may be pigmented, it gradually becomes paler until it eventually becomes white and more glistening. The other factors attendant upon its formation are too variable to formulate any guiding principle from them, since so much depends upon the original extent of the wounding, the amount of tissue destruction, the time and manner of healing, and the health of the individual, which factors are so often, in medico-legal cases, not within the knowledge of the witness. The furthest a medical witness ought to go in appraising the age of a scar must be founded entirely upon the particular case before him, and even then he ought to give a wide margin in his computation of time. From our experience we would not even generalise thus:[1] "The redness [of a scar] as a rule, lasts two, three, or four weeks, during the period of healing; the brown discoloration, for several months, or even for a few years; the bleached appearance for the rest of life." But we agree fully with the closing sentence of this quotation: "But the duration of each stage is subject to great variation."

FIG. 26.—Body of Australian Aborigine, showing Raised Scars. These are produced by making the wound with a sharp flint or shell, or piece of bottle, and keeping it from healing for a considerable time with the irritant juices of plants. (*Vide* Paper by the Author on "Australian Aborigines," *Trans. Philos. Soc. of Glasg.*, vol. xvii. p. 182.)

Given a case in which it is of importance to discover a suspected scar or scars, what are the best means for their detection? By reason of the fact that cicatricial tissue contains relatively fewer (if indeed, any), blood-vessels, per same unit of area, than normal skin of any particular portion of the body, any influence which will produce marked increase in the activity of the cutaneous circulation will form a good test. Perhaps the best way is either to apply some warmed substance to the part of the skin upon which the supposed scar is situated, or to expose that part of the nude body to the influence of heat from the fire, or to slap the skin with the flat of the hand. In reply to the

[1] Guy and Ferrier's "Forensic Medicine," 5th Edit., p. 15.

further question, Do scars increase in size? it may be said, that while, generally speaking, scars produced in infancy do grow to some extent, this rule must be viewed with caution, for we believe it is not equally true of all parts of the body. It is clear, however, that scars produced during adolescence and adult life do not increase or diminish in size after the cicatricial tissue has attained its full measure of contraction after the healing process. While scar tissue is usually depressed below the normal level of the skin, it sometimes happens that it is raised above that level. This is seen in Fig. 26.

B. **Tattoo Marks.**—The practice of tattooing which still prevails to a large extent among certain classes of civilised peoples, is a reversion to the desire for personal adornment which obtained among savage peoples. The practice of tattooing and the production of scar-markings on the bodies of certain savage tribes were, however, intended to serve a distinct purpose; the former indicated the rank or other virtue of the bearer, the latter, possibly also the rank, and, certainly, the tribal markings, so that by the marks (scars) on the body, the tribe to which the bearer belonged could be identified. In such cases, the scars were not depressed, or on a level with the ordinary skin, but were raised—thrown into relief.

The practice of tattooing is mainly prevalent among soldiers, sailors, and a certain class of civilians associated with both classes. We are not concerned particularly with regard to the manner in which such marks are produced; it is sufficient to say that by pricking the skin in the form of the device desired, and after the bleeding consequent thereupon has ceased, and the rubbing in of the pigment of the requisite colour or colours, the tattoo mark is produced. The extent of such marks varies among individuals; they may practically be extended over the major portion of the body, or may be confined to small areas. While the devices used are of the most varied character, from representing the full uniform of a general or an admiral, or the portrayal of a naval fight, down to the amateurish effort of a ring round the finger or a bracelet round the wrist, or to the initials of the name of the person, they most usually centre round those emblematic of love, of arms, of the sea, of war, or of religion. In many cases the presence of such markings on the body may lead to the identification of the individual not only during life but also after death. At Cheadle, near Stoke-on-Trent, a tramp was remanded on a charge of murdering a man named Bishop, a licensed victualler, at Walsall, the November previous. The tramp had entered Cheadle workhouse, and while bathing, some tattoo marks were observed on his body, which led to his arrest. In a general way, too, from the nature of the devices, which give a starting-point, the identity may be eventually established. A soldier will naturally prefer that the devices on his body should take the form of his association with arms, and the sailor with the sea. During a long experience as police surgeon we have seen a great variety of tattoo marks, among the more ambitious being the following:—

D. K., a sailor, had the following devices on his body. On the chest, the French arms, surmounted by a Union Jack; on the left forearm, a negro girl, two flower-pots containing plants in blossom; and on the right forearm, the

crucifixion, and a sailor holding a Union Jack; and in addition, the letters "D.K." The pigments used were red and blue—vermilion and Indian ink.

T. S., formerly a soldier, had on his right forearm, a palm-tree bearing fruit, with a negro climbing up the trunk, a very obvious figure of a negress, and a bracelet round the wrist; on the left forearm, a tree with red fruit, with snakes entwined round the trunk; an elephant; and a bracelet round wrist. The pigments used were cochineal and Indian ink. The devices were tattooed while he was a soldier in Burmah.

J. M., formerly a soldier, had on his right forearm the figure of a girl dancing, and holding a fairy rod in her right hand; on back of the forearm, an anchor and a cross; round wrist, an armlet; on the left forearm, in front, a Jack-o'-tar dancing on a barrel, and holding his cap in his left hand; on back of forearm, crossed flags, striped in colour; round wrist, an armlet. Pigments used were cinnabar and Indian ink.

FIG. 27.—Photographic reproduction (slightly reduced in size) of Tattoo Mark, in possession of Author. The outline and shading of Cross and of the Saviour are in Indian Ink, and the drops from the Hands, and the Wound in the Side, in Cinnabar.

In not a few cases, besides the initial letters of the name, further identifying particulars are tattooed. The pigments used in these devices have interest to the medical jurist solely with relation to their stability. Gunpowder, Indian ink, charcoal, common ink, Prussian blue, give the black or blue colour, and vermilion and cochineal, the red. With respect to the problem of identity, the question arises, May tattoo marks disappear naturally? Extended observation over a large number of cases at variably long periods after the time of their production has clearly demonstrated that such may disappear. Out of 37 cases, Casper found that *four* had completely disappeared from the skin, three had faded, and two had partially disappeared. Hutin of Paris observed out of 506 cases which came under his observation in the Hôpital des Invalides, that in 47 cases the marks had completely disappeared from the skin. Statistics need not be multiplied on this point, as it is well established. The disappearance from the skin has solely to do with the character of the pigment used, and the ratio of disappearances in any given series of cases depended upon this. The more stable the pigment, therefore—that is, the less easily absorbed—the greater the likelihood of the mark being a permanent one. Gunpowder, Indian ink, soot, charcoal, Prussian blue are the most fixed pigments; cinnabar, cochineal, ordinary

ink, the least; whenever, therefore, a known tattoo mark has disappeared naturally from its original position on the skin, in all probability the colour had been originally produced by one or more of the last-named pigments. In such cases the pigments have been absorbed into the lymphatic channels, and they will be found in those lymphatic glands into which pass the lymphatic vessels from the part of skin tattooed. Marks produced by the more stable pigments are permanent for life. We have seen them fresh in colour forty and fifty years after they were made. May tattoo marks be removed by artifice? Various observers declare they may: but no one has asserted that they can be without destruction of the skin in which the pigment is located; so that a scar replaces the tattoo mark. Various methods have been devised for their removal. Skillern[1] recommends the use of glycerole of papain as the most efficient and least painful method. The skin being first de-sensitised by chloride of ethyl spray, the marks are covered with the above substance, which is pricked into the skin as the original pigment was; then a dressing of the same material on gauze is applied to the part, and kept in position for five days. The marks at the end of that time will be disappearing. After the superficial crusts formed have separated, the procedure may be repeated, *de novo*, as many times as are necessary for complete removal.

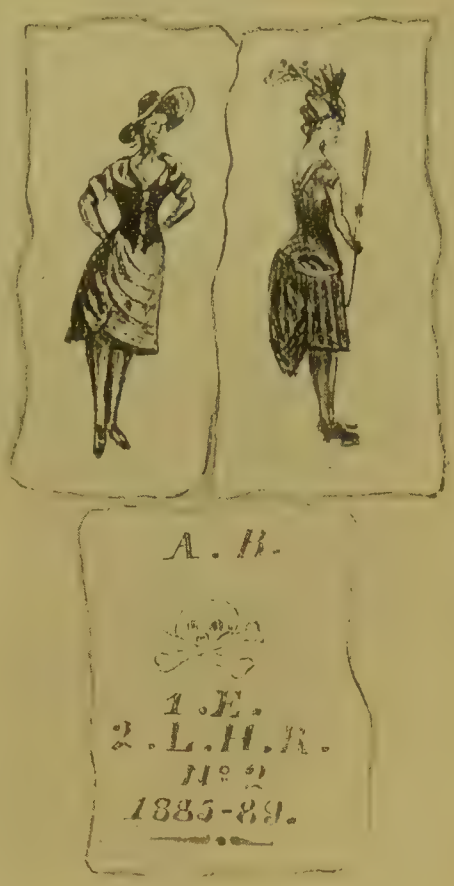


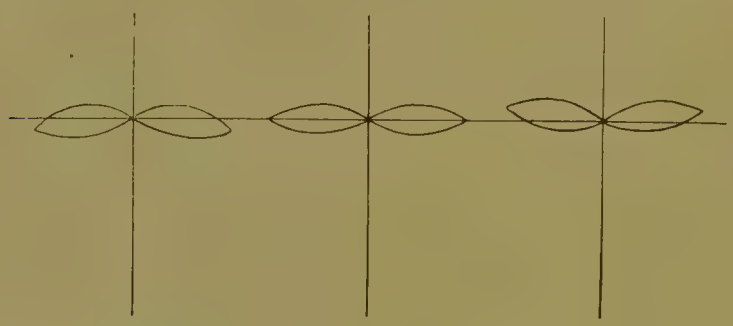
FIG. 28.—Tattoo Marks. From drawings of marks in possession of the Author, by Dr. Arbuckle Brown. The lowermost device indicates clearly how Identification might be effected. The female figures were pigmented red and blue, and the inscription in blue only.

Regarding tattoo marks, then, there are no better conclusions than those of Casper[2]—"That tattoo marks may become perfectly effaced during life; that in not a few cases they disappear so that they are no longer visible on that body when dead on which during life witnesses had often seen them, and that their existence at a former period may possibly be ascertained by an examination of the axillary glands."

[1] *Philadelphia Medical Journal*, June 18, 1898.
[2] "Forensic Med.," Syd. Soc. Edit., vol. i. p. 109.

To this, it may be added, that such artificial methods as are necessary for their removal produce skin lesions which result in the formation of scars. (*Vide* "Les Tatouages" by Lacassagne, 1881, for further details.)

Identity by Photographs.—This, as has been noted, was an early method of identification for criminal purposes, but has been found, by itself, to be wanting. At the same time, there is a range of cases in which certain anatomical features of the face and head may be studied with advantage as an aid to identification. Photographs were used in the Tichborne case, not only of the real heir and his family, but also, for comparison, of the claimant and his family. The main differences between those of the real heir and the claimant consisted in distinguishing peculiarities of eyes, ears, nose, and mouth. In photographs which are not "touched-up," blue and grey eyes print light, brown and black eyes print dark. The only features available for examination in a hirsute person are the nose and eyes, while in clean-shaven persons, these, with the nose-furrow and mouth, are available. The angle which the eyes form with a line drawn through the middle of the forehead and nose, gives valuable evidence in a photograph. There are three prevalent types of relations, as figured below, viz. :—



I. II. III.

FIG. 29.

1st, where the angle is a right angle (as in fig. II.); 2nd, where it is less than a right angle (as in fig. I.); 3rd, where it is greater than a right angle (fig. III.).

In the real heir (Tichborne case) the angle was greater than a right angle; in the claimant, less than a right angle. In the same way, characters of mouth and nose differ enormously in different persons. The claimant in that case had a narrow nose, set in a fat face; the real heir, a broad nose, with distended nostrils, in a thin face. The external ear is also markedly different in different persons, and is constant during life in the same person. For this reason the British Committee on Identification recommended that the ear should be part of the photograph to be put on the identification card. (Consult for further details "L'Oreille Externe," by Dr. L. Frigerio. 1888. Published by Steinheil. Paris.) If photographs are produced in court to prove any point, they must be sworn to as true by the witness who produces them; and the same is true of plans, drawings, etc., in connection

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with criminal or civil cases. The use of water-colour sketches in criminal trials of the bodies of those done to death, has not, so far as we know, been permitted in this country. In a case, however, tried at Paris, where an unnatural father was being tried for beating and burning the body of his child until it was a mass of sores and wounds of which it died, certain water-colour sketches of the body with its wounds and injuries—painted between the time of death and thirty-six days thereafter—were shown to the jurors as evidence of the effects of the parental brutality. Counsel for the prisoner objected to their use, but after three-quarters of an hour's deliberation the court permitted their use.

Identity as affected by the use of Hair-Dyes and Cosmetics.—This question first originated in a Parisian case in 1832. A murder had been committed, and one Bênoit was suspected; he was known to have black hair. At 2 P.M. of the day of the murder, Bênoit was seen by witnesses to have black hair, but three hours later he was seen at Versailles to have fair hair. Orfila was asked the question: Was it possible for the hair to be dyed fair? His answer was in the affirmative, as Vauquelin had, fifteen years before, showed the possibility of such being done by the use of chlorine. A Parisian hairdresser, asked the same question, answered in the negative. It is a common practice to-day, mainly for purposes of rejuvenation and of fashion. The hair may be made darker in colour, or it may be changed from a dark to a lighter colour. The former is done by the agencies of dyes, which are mainly preparations of lead, silver, or bismuth, and are sold under the name of Cyprian, Ebony, Persian, and Egyptian waters. Perhaps the most common ingredient in such dyes at present is bismuth. The preparation of Naquet may be taken as a type. It is a solution of bismuth in three parts of nitric acid, to which is added a watery solution of tartaric acid, the amount of the acid being equal to one-quarter the weight of bismuth used. To this mixture more water is added to ensure complete precipitation of the bismuth. The precipitate is then filtered and washed with water until the original acidity is lost. It is then dissolved in ammonia (℥i of NH_3 to ℥i of bismuth). Then sodium hyposulphate is added to the amount of three-fourths the weight of the bismuth used, and when the salt is dissolved, the mixture is filtered, and preserved in well-stoppered bottles. It should then contain about one-twentieth of its weight of bismuth. Such a dye produces shades of colour up to a deep chestnut. On application to the hair it loses ammonia, and deposits thereon the sulphide of bismuth. Silver preparations are applied to the hair, followed by a solution of sulphide of potassium. Indeed, in all preparations, the object is to colour the hair by a sulphide of the metal used. How to discover the presence of chemical dyes? A portion of the hair may be cut off and steeped in dilute nitric acid, which will give a solution of the salt sufficient in quantity for qualitative examination, which can be tested in the ordinary way.

The change of colour from dark to light is effected by some agent which has a bleaching property. The change may be produced (1) by chlorinated water, (2) dilute nitric or nitro-hydrochloric acid, 1–50, or (3) by peroxide of hydrogen. Probably the last-named substance is

now the most common ingredient of hair-washes intended for this purpose. In the examination of a person who is suspected of concealing his identity in this manner, the following points will be of value :—

1. Observe whether there are parts of the hair of a different colour from the rest—due to want of uniformity of application—a very likely occurrence where the individual himself does the work ;
2. Observe whether the scalp be of its natural colour or not—since the scalp is apt to be dyed also ;
3. Note the appearance and texture of the hair itself. The hair, if coloured black by dye, has lost its glossiness; it is a dull, lustreless black. The texture is roughened, the hair feels coarser. If bleached, there is likewise loss of lustre, and the hair is brittle ;
4. Compare the hair of the head with that of other parts of the body, since the person who dyes his hair for avoidance of identity will usually confine his attention to dyeing those parts seen by the public ;
5. If in doubt, shave the hair, or cut it close, and observe, while the person is in custody, the colour of the new growth ;
6. Subject the hair to chemical analysis

Identity from the Presence of Wounds on the Body.—On rare occasions the presence of wounds on the body may assist in associating a given suspected criminal with a given crime. A few years ago, in Glasgow, a thief broke the plate-glass window of a jeweller's shop, snatched a tray of watches, and escaped. On examination of the window after the robbery, a small, almost circular, piece of skin was found adhering to the sharp edge of the fractured portion of the window. This was carefully preserved. Meanwhile the authorities looked out all the thieves whose speciality was shoplifting ; the hands of each were examined ; on the finger-tip of one of them a wound was found, not healed, of a nearly circular shape, and on the surgeon applying the piece of preserved skin it was found to fit almost exactly. Another case which fell within our own observation was as follows : A young girl of thirteen years of age was brought to the Police Chambers by her mother, owing to the allegation of the girl that a man had criminally assaulted her. Examination of her person proved the truth of the statement. Her genitals were bruised and swollen, the hymen ruptured, and her underclothing soaked with blood. Examination of the *locus* of the crime showed a considerable amount of blood on the flooring of the stair landing. A man, answering to the description of the girl, was apprehended, and the girl identified him as her assailant. On examination of the prisoner, with his consent, we found a recent rupture of the *frænum penis*, the inner surface of his trousers—which were of corduroy—gave evidence of blood in the seams, although they had been recently washed, and the soles and nails of his boots also gave unmistakable evidence of blood. We gave it as our opinion that the rupture was of recent origin, corresponding in point of time to that of the assault, that he had sustained the injury from forcible penetration of his organ into a cavity commensurately smaller, and

that it was not likely to have been caused by intercourse with his wife. As usual, the accused strenuously denied the accusation, but at his trial before the circuit court he pled guilty. The above cases may be taken as exemplary of the relation of wounds leading to identity of accused or suspected persons.

Identity from Footprints.—It has been the custom in text-books on Forensic Medicine to deal with this subject at some length. We do not propose to consider the general question, as we believe this is one which may and ought to be solved by the police authorities themselves. At the same time, the medical witness is expected to deal with the case of bloody footprints. This question arose in the famous Sandyford (Glasgow) murder case in 1862. On the flooring of the room in which the murder was believed to have been committed were certain bloody footprints, and, as at first two persons were implicated in the crime, it became of importance that the footprints should be identified. The late Sir George H. B. Macleod, Professor of Surgery in the University of Glasgow, at that time police surgeon, gave evidence on the subject at the trial. He caused the planks of the flooring on which the marks were, to be cut out *en masse*, and to be preserved. This was produced at the trial. There were three footprints, all of them of the left foot. The witness compared by measurement the footprints found with those of both of the persons implicated and with that of the deceased woman. The measurements did not correspond with those of the left foot either of the deceased or of one of the suspected persons, but they did correspond with those of the foot of the female prisoner, and the witness stated that, in his belief, they were footprints such as might have been made by this prisoner's left foot.

Identity from Occupation Markings on the Hands.—This subject has received less attention than it ought from the medico-legal point of view. M. Maxime Vernois in a paper, "De la Main des Ouvriers et des Artisans au point de vue de l'Hygiene et de la Médécine Légale,"[1] deals with some important aspects of the subject, and his paper may be perused with profit. At our suggestion, Mr. Charles A. Cathcart, M.B., while a student with us, collected a large number of observations over a long period in the case of workmen treated in the Western Infirmary, Glasgow, the accuracy of which we can personally corroborate. His observations embrace the occupations of engineer, mason, hammerman, riveter, smith, joiner and carpenter, baker, weaver, coachman, tailor, violinist, miner and others.

In engineers, the most distinctive mark is (1) a callosity at the junction of thumb and forefinger of left hand, due to the friction of the chisel; in addition (2) there is a series of callosities on the projecting surfaces of the palmar aspect of the fingers and palm of right hand, due to friction of hammer-shaft. The skin of hand is also engrained with oily débris. The latter series of callosities is common, however, to all workmen who use the hammer, and they may be found on the reverse hand in the case of left-handed persons. In masons, there are (1), a series of markings as in engineers, due to friction of mallet; (2), usually, in addition, there are small callosities on the skin

[1] "Médécine Légale," 2nd Series, 1862, vol. xvii. p. 180.

over the joints of right forefinger and thumb, from head of mallet; (3) there is a distinct callosity on skin over dorso-ulnar surface of first phalanx of left thumb, due to the chisel; and the hands have the feeling and appearance of dryness. In hammermen, riveters, smiths, there is a series of callosities of the right hand, as before, and also of the left. The callosities of the right hand are usually well marked on the first finger and thumb, due to the hand of the workman sliding up and down the hammer-shaft whilst at work. The skin of the hands is usually engrained with grimy dirt. In riveters and smiths especially, evidence of scorching is often found on the hands, and in smiths particularly, innumerable small cicatrices from spark-burns are often found. In joiners and carpenters (1), nearly the whole palm of the right hand, especially the back part, and base of thenar prominence, shows hardened surfaces, due to pressure of plane; while the palm of left hand may also show slight evidence of hardening; (2) callosities, due to same cause, are also formed on first and second joints of thumb, and at base of fore-finger of right hand. Joiners often have the right shoulder down and the left up, due to the lopsided character of their work. In bakers, callosities are found on the second and third joints of both little fingers due to rolling out dough by hand-roller, as also a callosity on the third joint of each third finger, due to pounding rice flour. (They have, as a rule, diseased teeth, due to the lodgment of flour and want of cleanliness.) In power-loom weavers, callosities are formed on the forefinger and thumb-tips of each hand, due to the friction of the thread. Hand-loom weavers have callosities on prominent parts of "grasping" hand, due to the handle of the fly-shuttle. Coachmen show callosities between the thumb and forefinger, and between the third and fourth fingers—both of left hand—due to friction of reins. Tailors show puncture marks of needle on forefinger of left hand, and prominent position and development of "sartorius" muscle. Violinists have the tips of fingers of left hand hardened, due to pressure on strings. This is not very marked, however. Miners exhibit callosities similar to those of hammermen, due to pick-handle. Their hands and face often show small engrained blue specks due to particles of coal-dust driven into the tissues after blasts of explosives. Dyers, photographers, and chemists have hands more or less stained with dyes or chemicals.

Identity from Handwriting. — It only happens in exceptional circumstances that a medical man may be called upon to give evidence respecting handwriting; but the question may arise (*a*) in cases where from certain paralytic or mental conditions it might be important to have an opinion whether a given person could or could not have written a document, such as a letter or a will; or (*b*) when called to identify the signature of a person to a will in which, upon emergency, a medical man had been required to write down the last will and testament of a testator. Such a duty as this, a medical man should not undertake if it be at all possible to obtain the services of a practitioner in law. However, assuming that he undertakes to do it at the urgent request of the testator and friends, the following points ought to be attended to, viz.: (*a*) the wish by the testator that the medical man undertake

the duty should be expressed before witnesses who shall not be affected in any way by the provisions of the will; (*b*) that the person is in a fit state mentally to give instructions as to the disposal of his estate; (*c*) that the spoken desires of the testator be transmitted to writing in the words by which they are expressed, or as nearly as may be; (*d*) that any questions asked should only be made to make clear the terms of the will; (*e*) that after completion of the writing it should be read over clearly and deliberately to the testator, who should thereafter adhibit his signature in the presence of the witnesses, who, in turn, should sign by their full signatures, designations, and addresses, as witnesses of the testator's signature. The opinion of medical witnesses may be required in the case of disputed wills where the testamentary capacity of the testator is called in question. While the condition of the testator at the time of signature is likely to affect the writing, each case must be considered and judged upon its own merits, and no guiding principle can be laid down. In ordinary cases where identity is attempted to be established by this means, the question is usually put before experts in handwriting. It is of passing interest to note that such evidence was of considerable value in the conviction of two medical men who were charged with the heinous crime of poisoning, viz., in that of William Palmer who poisoned John Parsons Cook, and that of Thomas Neill Cream for the poisoning of more than one woman. Palmer denied that he had been with Cook the two days before his death, but entries under these dates in his diary to the effect that he had been with Cook were produced at the trial. Moreover, in the Tichborne case, letters by Arthur Orton, the Claimant, signing himself Roger Charles Tichborne, and by the real heir, which were shown in court, indicated clearly that the person or persons who wrote the two former, could not have written the last, and from the similarity in formation of letters of the first two, that they were in all probability written by the same person.

CHAPTER IV.

IDENTITY OF THE DEAD.

It will be obvious that some of the means which are open to medical jurists to establish identity in the case of living persons are equally available for the identity of the dead; as, for example, bodily markings of natural origin or of artificial production. But in the latter, the opportunity to dissect the body may materially assist in effecting identification in a way not possible in the former. The identity of the dead may require to be established under differing circumstances, as (1) in the determination of certain remains that they are those of a fœtus, and that they are of a certain age of uterine existence; (2), in establishing the identity of the sex and age, and, if possible, the cause of death of a body in which decomposition has so far advanced that identity cannot be established by ordinary visual methods; (3), in discovering the identity of certain bones which have been found, in respect to whether they belong to a human being or to one of the lower animals; (4), in identifying from certain mutilated parts of a body the sex, age, height, etc., of the person of whose body they formed a part; and (5), in other like contingencies.

In all of these conditions, however, the solution of identity resolves itself into a consideration of the following facts, viz., (*a*), with reference to *age*; (*b*), with reference to *sex*; (*c*), with reference to *stature*; and (*d*), with respect to the presence or absence of *bodily deformities or peculiarities*.

I. With Reference to Age.—The body of an unknown person being found under circumstances of suspicion, the medical jurist is expected to form some judgment with respect to its age. This, even in the case where decomposition is not advanced, is not always easy. In the case of young children, a very fair conclusion may be arrived at from the eruption of the teeth, the general development, height, and weight of the body, and the condition of ossification of the bones. But not always, from the condition of the teeth, can even an approximately accurate reply be given, for the teeth do not always appear in the order given in the books. In like manner, we may be led astray by the condition of development, and the height and weight, more especially in the case of children born and reared in cities, by reason of rickets, or syphilis, which disturbs prejudicially these factors. Advancing a little, it will be found that the difficulty does not become lessened as the scale of years is ascended. The time of onset of puberty in girls, and of virility in boys, is very variable, and although from a large mass of cases we may be able to formulate some average age at which they appear, the calculation does not apply to the individual. Approaching middle life, the greatest difficulty is experienced,

owing to the cumulative effect upon the individual of inherited conditions and of the vicissitudes of life. The worry of toil and business, the high pressure at which life is carried on in our cities, the habits of life, and the environments of existence, all produce physical effects which leave their mark upon the body, but which are difficult to appraise or predicate. Every one is acquainted with the prematurely old man and with the comparatively active old man. Generally speaking, there is less difficulty as we approach old age, subject, however, to what has been said. The shrunken, lean person, the shrivelled, dry skin, the toothless jaws, the hollow temple and eyes, the general loss of fat from those parts which in an earlier stage of life give roundness to the form, the hard, cordy, rolling condition of the arteries, and other conditions, are all indicative of the degenerative stage of life. So far, these are but general considerations which may be observed of all, and any attempt to divine the age of the person therefrom, with any claim to accuracy, will entirely depend upon the observant faculties and experience of the observer—in short, upon individual accuracy.

From this aspect, we turn to the means at our disposal in the body, anatomically, for assisting in the discovery of the age of any particular body.

In connection with charges of criminal abortion, infanticide and concealment of pregnancy, or concealment of birth, it is important for the authorities to know whether certain substances found are the product of conception, or, in the latter cases, whether or not the fœtus was viable. It is requisite, therefore, that the medical witness should be able to recognise, and to fix the stage of development of, the products of conception of the first few months of pregnancy, and also the appearances of the fœtus in the later months of pregnancy.

Development of Fœtus.—I. *At end of First Month:* The entire ovum is about the size of a pigeon's egg, and measures about $\frac{3}{4}$ of an inch in diameter. The chorion is entirely covered by villi. The umbilical vesicle is fully developed. The embryo itself measures about $\frac{1}{3}$ inch in length. The caudal extremity is well marked. The eye-spots appear as dark dots, and the limbs appear as buds or dot-like processes.

II. *At end of Second Month:* Between 5th and 6th week, the embryo measures about 15 mm., or $\frac{5}{8}$ of an inch in length. The bud-like limb processes begin to show evidence of three distinct segments—the rudimentary arm, forearm, and hand—and of the lower limb, the thigh, leg, and foot. By the end of the 8th week, the fœtus measures about 22 mm. in length, and the caudal extremity shows signs of disappearance. The rudimentary eyelids begin to appear, and also the concha of ears. The whole chorionic sac measures about 40 mm. in diameter.

III. *At end of Third Month:* The fœtus measures from 55–75 millimetres—$2\frac{1}{2}$ to 3 inches. Weight about 4 ounces. The head becomes more rounded. The development of the ribs is now seen. Sex is still indefinite. Rudimentary nails, like thin membranes, appear on fingers and toes. The placenta is formed and differentiated. The umbilical vesicle and allantois have disappeared.

IV. *At end of Fourth Month:* Length = 5 to $7\frac{1}{2}$ inches; weight, from 3 to 9 ounces; skin of fœtus is rosy in colour and fairly dense; mouth is large and open. The *membrana pupillaris* (which corresponds to the *membrana nictitans* of birds) is very distinct; the nails on fingers and toes begin to appear. The genital organs are sufficiently developed to enable sex to be recognised; downy hair appears on the body and scalp; meconium may be found in very small quantities in the intestine. The umbilicus is situated nearer the pubis than the centre of the body.

Points of *ossification* may be found in *occipital, sphenoid, nasal,* and in *squamous portions of temporal,* bones; also in the *ischium,* and in the *upper part of sacrum and pubis.*

V. *At end of Fifth Month:* Length = 6 to 10 inches; weight = 6 to 12 ounces; the head is disproportionately large to the size of body; the nails are now distinct; growth of hair advances; skin, as yet, does not show sebaceous secretion; the kidneys are large and lobulated, like the permanent condition of those of a sheep; germs of teeth appear in the jaw-bones.

Additional points of ossification are to be found in the *os calcis,* and *pubis,* in the *atlas vertebra,* and *odontoid process of axis;* there is ossification of *stapes* and the *petrous portion of temporal bones.*

VI. *At end of Sixth Month:* Length = 9 to 12½ inches; weight = about one pound; skin is now divisible into *cutis vera* and *epidermis,* and is wrinkled; eyelids still closed by *m. pupillaris;* umbilical cord is situated a little above pubis; hair of eyebrows and eyelashes begins to form; the *testes* are found lying close to the kidneys; cerebral hemispheres now cover cerebellum.

Additional points of ossification are to be found in the *four divisions* of *sternum,* and a *middle point,* at *lower end* of *sternum.*

VII. *At end of Seventh Month:* Length = 13 to 15 inches; weight = 3 to 4 pounds; nails do not yet reach the extremities of the fingers; *membrana pupillaris* now practically disappears; at least, it has become so thin and transparent that it is difficult to detect; *testes* are found in the act of descent towards the scrotum, in the vaginal process of peritoneum; cerebral convolutions now begin to appear.

Additional points of ossification are now found in the *first sacral vertebra.*

VIII. *At end of Eighth Month:* Length = 14 to 17 inches; weight = 4 to 5 pounds; sebaceous secretion begins to be formed on skin; the nails now practically reach the extremities of the fingers; *membrana pupillaris* has now entirely disappeared; one testis, usually the left, may be found in the scrotum, the other, the right, is well advanced in its downward descent.

Additional points of ossification are found in *second* and *last sacral vertebræ.*

IX. *At end of Ninth Month:* Length = 18 to 24 inches; weight from 6½ lbs. upwards, the average weight being about 7 lbs. Children, however, have been born weighing 12 lbs. and 15 lbs.[1] The centre of body is about three-quarters of an inch above the umbilicus; hair is found on scalp and on portions of body; sebaceous secretion is likely to be found in flexures of joints, and more or less over the whole body; both testes are in scrotum; the finger nails are fully formed and developed; the occipital bone is yet divisible into four osseous parts.

Additional point of ossification of importance is that found in the *centre of cartilage at lower extremity of the femur.*

What, now, are the means whereby the age of a child after birth may be ascertained? The easiest test is the eruption of the milk-teeth. On the average, the respective periods of eruption of the different teeth are fairly constant in point of time. At the same time, it ought to be remembered that these teeth may appear either abnormally early (indeed, some of them may, in certain rare cases, be present at birth), or their appearance may be abnormally deferred, the cause of the former usually being precocious development due to factors not yet well ascertained, but which are generally believed to be hereditary, and of the latter, hereditary disease. Precocious dentition has been frequently recorded, but probably no one has done more in this direction than Ballantyne of Edinburgh, whose teratological researches are worthy of much praise. The teeth which usually signalise this precocious dentition are the central incisors. We have seen three such cases, in all of which the upper central incisors were congenital teeth. For a complete account of recorded cases, however, the reader is referred to a paper by Ballantyne, in which many cases are given.[2]

[1] *B. M. J.*, vol. i. 1901, p. 16.
[2] *Edin. Med. Jour.*, vol. xli. p. 1025.

The following Table may be held to indicate approximately about what periods the different milk-teeth appear.

I.	Central Incisors,	from	6th to 7th	month.
II.	Lateral do.	,,	7th to 10th	do.
III.	First Molars,	,,	12th to 15th	do.
IV.	Canines,	,,	15th to 20th	do.
V.	Second Molars,	,,	20th to 36th	do.

These temporary, or milk, teeth number twenty in all.

In addition to the evidence obtainable from this source, certain concurrent information may be obtained from examination of additional centres of ossification.

At one year: In *lower* ends of humerus and ulna; in *heads* of humerus and femur; in the upper part of tibia.

About one and a half years: The anterior fontanelle is rapidly closing, except in rickety and syphilitic children.

At two years: Ossific points appear in *lower* ends of radius, tibia, and fibula.

The temporary teeth begin to be shed from the fifth to the seventh year. It ought to be noted here that in exceptionally rare cases the appearance of teeth may be delayed for a very long time. We have examined a boy of eleven years who did not then possess, and never had possessed, any teeth, and judging from the appearance of the jaws, was not likely ever to have any. It must further be remarked that the temporary teeth, or some of them, may be retained till advanced adult age; we have seen them in a man over sixty years, in whose upper jaw especially, there was a double row of teeth. Between the ages of two and six to seven years, we must look for guidance to centres of ossification.

At two and a half years: Points of ossification (additional) in *head* of *humerus;* in *lower ends* of *four last metacarpals;* and in *patella.*

At three years: In the great trochanter of the femur.

At four years: In the *second* and *third cuneiform tarsal* bones.

At four and a half years: In the *smaller tuberosity* of *head* of *humerus*, and in *head* of *fibula.*

At six years: The *descending ramus of pubis* meets the ossification of the *ascending ramus of the ischium.*

About this period, the permanent teeth begin to be erupted. The following Table indicates the average ages at which the permanent teeth begin to appear in the mouth.

I.	The first Molars,	about	6th to 7th year;
II.	The middle Incisors,	,,	7th to 8th year;
III.	The lateral do.	,,	9th year;
IV.	The first Præmolars, or Bicuspids,	,,	10th year;
V.	The second Præmolars,	,,	11th year;
VI.	The Canines,	,,	12th to 12½ year;
VII.	The second Molars,	,,	13th to 14th year;
VIII.	The third do. or Wisdom teeth,	,,	20th to 24th year.

It will thus be seen that the first molars appear about the seventh year of age, the second molars, about the fourteenth year, and the third

molars, about the twenty-first year. Probably there is greater uncertainty respecting the time of eruption of the third molars than of the others; indeed, in some rare cases, they do not appear till adult age is well advanced. Of 1046 children examined by Mr. Saunders,[1] 389 out of 708 of 9 years of age had the number of teeth corresponding to the above Table. If we accept his principle that "where the teeth of one side are fully developed those of the other side should be reckoned," then 530 of the 708 came up to the standard. Of the remainder (1046 – 530), 516, the age could be arrived at from the appearance of the teeth alone within one year of the actual age, and that one year less than it really was. Since for the purposes of the Factory Acts medical inspectors must, in the absence of certificates of birth, arrive at the ages of employed children in order to conform to the age-requirements of the Acts, it is important to keep in mind the foregoing data.

In the adolescent state from fifteen years upward, an approximately accurate estimate of the age can only be given by attending to the additional centres of ossification and the progress of that ossification in the unification of bones.

At *eight years*, ossification is established in *upper end* of *radius;* at *nine years*, the *ilium*, *pubis*, and *ischial* ossific centres meet together in the cotyloid cavity—the acetabulum—to form the *os innominatum*. At *ten years*, ossification begins in the *epiphysis* of the *olecranon;* at *twelve*, the bony nucleus of the *pisiform bone* appears; at *thirteen*, the union of the three parts of the *os innominatum* is nearly complete, though they are still separable; and an ossific point appears in the *lesser trochanter* of the *femur;* at *fourteen*, about *twenty more ossific points* appear; in *sacrum*, in the *epiphysis* of *crest of ilium*, in *anterior inferior spinous processes*, *ischial tuberosity*, and *symphysis pubis*. At *fifteen years*, the *coracoid process* unites with the main part of the scapula, and the *two nuclei* of the *acromion process* appear; at *sixteen*, the *olecranon* process *unites* with the *rest of ulna*. Between *eighteen* and *twenty*, the *upper epiphysis* of *femur* is joined to the shaft, the *epiphysis* of the *sternal end* of *clavicle* ossifies, the *superior epiphysis* of *humerus* unites with the *shaft*, and the *inferior epiphyses* of *radius* and *ulna* with their respective *shafts;* and in like manner, the *epiphyses* and *shafts* of the *metacarpals* and of the *phalanges* unite. At *twenty*, the *upper* and *lower epiphyses* of *fibula*, and the *lower epiphysis* of *femur unite* with their *shafts*. At *twenty-five*, the *epiphysis* of the *sternal end of clavicle* and the *epiphysis* of *crest* of *ilium unite* with their respective bones. And from twenty to thirty years of age, ossific plates form on bodies of the vertebræ.

An individual may, therefore, be said to be of adult age when the epiphyses of all the bones are united to their shafts, and when the wisdom teeth are present.

After apparent adult age has been attained, and particularly toward later adult age, some indication of more exact age may be ascertained from the following, viz. :—

(1) From the angle which the neck of the femur forms with the shaft.

Before puberty the neck of that bone has an oblique direction, constituting an easy curve from the axis of the shaft; in the adult, it forms an obtuse angle; and in old age, it becomes more horizontal, the head falling below the level of the trochanter.

(2) From the dentulous or edentulous condition of the jaws. As

[1] "The Teeth a Test of Age," 1837.

age advances the teeth are lost either from disease in themselves, or from the gums and alveoli losing their hold of the roots. This process, however, is expedited by the facility with which artificial indentures may be supplied.

(3) From degenerative changes in certain parts of the body; (*a*), ossification or calcareous deposits in parts usually cartilaginous, such as the larynx and costal cartilages; (*b*), thinning, from absorption of the bones of the skull, scapula, etc.; (*c*), atheromatous or calcareous changes in the coats of the arteries; (*d*) the *arcus senilis;* (*e*) the altered angle of the ramus of the lower jaw.

With respect to the age of the body of which mutilated remains only are available for examination, the question of age can, usually, be answered only in a general way. The ability to answer will depend very largely upon the parts available for examination, both with respect to their amount and to their variety. In the Wainwright murder case, the age of the victim—Harriet Lane—was considered to be about 25 years, because of the presence of the wisdom teeth. In other cases, the distribution of hair upon certain parts of the body, the condition of the bones in the parts found with relation to ossification and muscular markings, and the appearance of the teeth, will assist in the determination.

II. With Reference to Sex.—Any difficulty on this question can only arise in the examination of bodies of those of doubtful sex—so-called hermaphrodites—or where decomposition is so far advanced that the external and internal organs of generation have disappeared, either from exposure in the air or water, or after burial in the ground, or where portions only of a body are available for examination.

The general characters which differentiate the sexes may be summed up as follows:—The male is generally of larger build than the female, although the effeminate male and the masculine female must be kept in recollection; the adult male is broader at the shoulders than at the hips, the adult female, the reverse; muscular development is more marked in the male than the female; hair only covers the *mons veneris* in the case of the female, but it covers the pubis and may extend upwards on the abdomen, and more or less, over the anterior surface of the chest, in the male; while the hair of the male head according to the custom of civilised peoples is shorter than that of the female. The larynx of the male is more developed forward in the *pomum Adami* than that of the female. In the case of mutilated remains, identity is only likely to be accurate when those parts of the body bearing characteristic sexual parts are available. In this connection it is well to remember that the uterus is about the last, if not, indeed, the very last organ of the body, to resist putrefaction; consequently when abdominal remains are available, this organ or its appendages ought to be carefully looked for. Should this organ and the appendages be absent, however, then we must fall back upon the disposition of the hair on the body, the presence or absence of the mammæ, the presence or absence of *lineæ albicantes*—as indicative, most probably, of previous pregnancy—and any external sexual remains which may be left attached to the pubis. In the Wainwright murder case, for example, the body was very roughly divided into

ten parts—so roughly, indeed, that parts of the pelvis were cut with the thighs, which *a priori* indicated absence of anatomical knowledge. But the presence of the uterus and of *lineæ albicantes* on the skin of the abdomen enabled Mr. Larkin to say that the remains were those of a woman of adult age who had borne, at least, one child.[1] Again, in the case of a London mystery which occurred in 1857, Dr. Taylor was able to discover the sex to be that of a male from the appearances of the bones, and from a portion of the *corpus cavernosum penis* of one side which was left adherent to the ischium.

The following case in which we were engaged very well illustrates some of the problems which have been dealt with, and others yet to be discussed. We were asked to make an autopsy of the remains of the body of a young person which had been jammed into a Gladstone bag, the bag for some months prior to the discovery of the remains having been concealed in a trunk belonging to a young woman. The discovery was brought about by reason of the horrible stench which they occasioned while the trunk was in the house of some people with whom the young woman lodged. The circumstances of the case as they came out at the trial were these. Between five and six months before the above discovery was made, the young woman, whom we shall call X., came home to nurse her mother, who had, after the death of the young woman's father, cohabited with the brother of her deceased husband, to whom she bore children. The mother eventually died a few weeks after the young woman's arrival. About that time, one of the children of this illicit connection—step-sister to the young woman—took ill, and within a few days disappeared. To some neighbours the young woman told the story that the said child had been sent away to some friends of her mother, to others, that it was sent away to a hospital in Glasgow to be treated. The child never returned. It was proved in evidence that this young woman continued to take the monetary parochial relief which had been given during the life of the mother for the maintenance of the mother and the children, including the one in question, up till the time of her apprehension on the charge that she had put this child to death. Post-mortem examination of the bodily remains showed that the body was in a very advanced state of decomposition, the head, trunk, and limbs being practically devoid of soft parts,—in short, the body was substantially skeletonised. By cutting open the bag, it was evident, from the attitude in which the body was found, that it had been thrust with great violence into this confined space—because the bag was comparatively small. In the bag, and covering, to some extent, the body, was a piece of woollen shawl, and, on the body itself, were the remains of an ordinary chemise. Round the neck—or the cervical vertebræ, for that was all that was left of the neck—was a piece of ordinary unbleached cotton cloth, in the form of a band. This encircled the neck twice and was tied in a double knot, but it was continued up on the face, where, in a spread-out fashion, it formed a tightly applied covering over the nostrils and mouth. The hair of the scalp which was abundant in quantity, was of a light-brown, or mouse-brown, colour, and was much matted. When the body was stretched out as straight as possible, it was found to measure between 33½ and 34 inches, but when allowance was made for the loss of the soft structures of the soles of the feet and of the scalp, the total height would, in all probability, reach about 35 inches. This height, therefore, corresponded to the average height of a child about four years of age. From the very advanced state of putrefaction of the external generative organs, the evidence of sex could only be obtained from what remained of the much-decomposed abdominal organs, which were irrecognisable as they presented themselves, being fused together into a shapeless mass. However, by careful dissection and examination, we were able to detect anatomical remains of the muscular portion of the vagina, and of the uterus; thus showing the body to be that of a female. The other determining factors were (*a*), the height of the body, which has been already given; (*b*), the condition of the bones; and (*c*), the condition of the teeth. The height was about 35 inches. The long bones of the limbs were immature in structure,

[1] *B. M. J.*, Dec. 11, 1875.

the epiphyses being composed partly of cartilage and partly of bone. The total number of teeth present in the mouth at the time of examination was fifteen, but five vacant places in the front of the jaws showed where teeth had been present, but had fallen out during putrefaction and by the handling of the body. The total number of teeth which had been present in the jaws was, therefore, twenty in all. All of these were fresh and good, except the back molars on each side of the lower jaw, which were carious. Keeping in mind that in the average child, the twenty temporary teeth are usually all present from the age of two to two and a half years and that they remain until about the age of seven, when the permanent teeth begin to erupt, we were able to say from this, and from the other facts named, that the remains were those of a child about the age of four, and, judging from the appearance of the teeth themselves, that the child had no evidence of inherited disease nor was the subject of chronic ill-health. From the examination of the remains, of which the preceding is a summary, we reported to the criminal authorities the following as our opinion, viz. :—

(1) That the body was that of a female child of about four years of age;
(2) That the body had been violently crammed into the Gladstone bag;
(3) That the body had lain in the bag for a period of from four to six months;
(4) That, by reason of the absence of the soft parts of the neck, and of the internal organs of the chest through decomposition, we were unable to state what was the cause of the child's death;
(5) For the same reason, we were also unable to say whether the cloth which was found round the neck in the form of a band, and which had been evidently tightly applied over the mouth and nose, had been applied equally tightly round the neck, or whether the cloth had been applied during life or after death.

In a subsequent Report to the criminal authorities in reply to the question—Whether, assuming that the cloth was tied over the face during life, it was in such a position, and of such a texture, as to cause death by suffocation, we stated it as our opinion that, on the above assumption, the application of the cloth tightly over the mouth and nostrils during life would, undoubtedly, cause death by suffocation, which would be more certain, by the cloth-band or ligature round the neck, on the same assumption.

Returning, however, to the discussion of the general case of identity with reference to sex, it may be necessary for the medical jurist to pronounce an opinion as to the sex of adult skeletal remains. By consideration of the character of the long bones with reference to muscle-attachments, and especially of the shape and dimensions of the pelvis taken as a whole, such an opinion may usually be arrived at having a good claim to correctness. Generally speaking, the bones of the female skeleton are lighter, are not so large, and muscle-attachment marks not so pronounced, as in the male. Again, the angle of the neck of the femur with the shaft may be of some assistance; in the female, it approaches more to a right angle, by reason of the greater transverse diameter of the pelvis, whereas in the male, it is more of an obtuse angle. The pelvis, however, must be reckoned as the chief means of differentiating sex in a skeleton. Contrasted with the male pelvis, that of the female has the following points of difference, due entirely to the preparation for child-bearing: the pelvis is shallower, and is of greater dimensions in its transverse, oblique, and antero-posterior diameters; its cavity is, therefore, more capacious, the bony framework is less massive, is smoother, and what parts are angular in the male are rounded. The alæ and crests of the ossa innominata are spread farther apart; the sacrum is wider and flatter, and, in consequence, the promontory of the sacrum is less prominent; the thyroid foramen is smaller and of a triangular shape; the arch of the pubis is wider and more curved.

Translated so far as may be into figures, the following Table shows the typical measurements of the diameters of the female and male pelvis respectively:—

Diameter.	Male Pelvis.	Female Pelvis.
Anterior-posterior, or Conjugate .	4 inches.	4½ inches.
Oblique	4¼ do.	5 do.
Transverse	4½ do.	5¼ do.

III. With Reference to Stature.—The calculation of stature comes to be a matter of necessity only when the examiner is called upon to deal with a skeleton, more or less complete, or with a few bones only. Any calculation, so worked out, must depend for its correctness upon the presence, practically, of one complete half of the skeleton so far as the limbs are concerned, of the vertebral column, and of the skull; otherwise, it cannot be considered free from error to the extent, probably, of inches. The best way to determine the measurement in such a case is to place the bones in their anatomical relationship to one another, on a soft bed of potter's clay, making certain allowances for the soft parts, and then to measure. The height thus ascertained, with 1½ inches added, will approximately equal the height of the person. We are disposed to discount very largely any conclusions from averages, because, up till now, observations have been made upon too few cases in any given series to pretend even to any average accuracy. A rough and ready method, applicable to certain parts of a skeleton, is based on the fact (which is, however, approximately correct only), that the height of a person corresponds to the measurement from the tip of the middle finger of the one outstretched arm, across the chest, to the tip of the middle finger of the other outstretched arm; applying this principle to the skeleton, it may be roughly reckoned that the sum of twice the length of the bones of the arm, twelve inches for the clavicles, and one and a half inches for the supra-sternal notch, will equal the height of the body. Such a rule, however, loses any accuracy it may possess for the average male, in the case of the female.

What is sometimes an interesting question, although it but rarely emerges into one of extreme medico-legal importance, is where a quantity of bones have been discovered in some secret place all huddled together, whether the bones are those of a human being or those of an animal; or, whether there are some of both. The case usually presents no difficulty to the individual who has the necessary knowledge of human osteology, such as the student of medicine or a medical man, especially where the bones of a more or less complete skeleton are found. The late Professor Ogston[1] adduces the following illustrative case. In a certain house in Aberdeen which had been inhabited by a woman who was executed in 1824 for the murder of her husband by "pouring oil of vitriol down his throat when drunk in bed," a quantity of mutilated and charred bones

[1] "Lectures on Medical Jurisprudence," p. 73.

were found under the hearth-stone of one of the apartments. He was asked to examine them, and, after doing so, concluded that they were the bones of a sheep. A similar case fell within our own experience in the demolition of a house in Glasgow for railway purposes, and here, also, the bones were those of a sheep. It may be wondered why all this secrecy about the bones of a sheep; but when it is explained that the stealing and killing of a sheep was attended by capital punishment, the reason for the secrecy becomes more apparent.

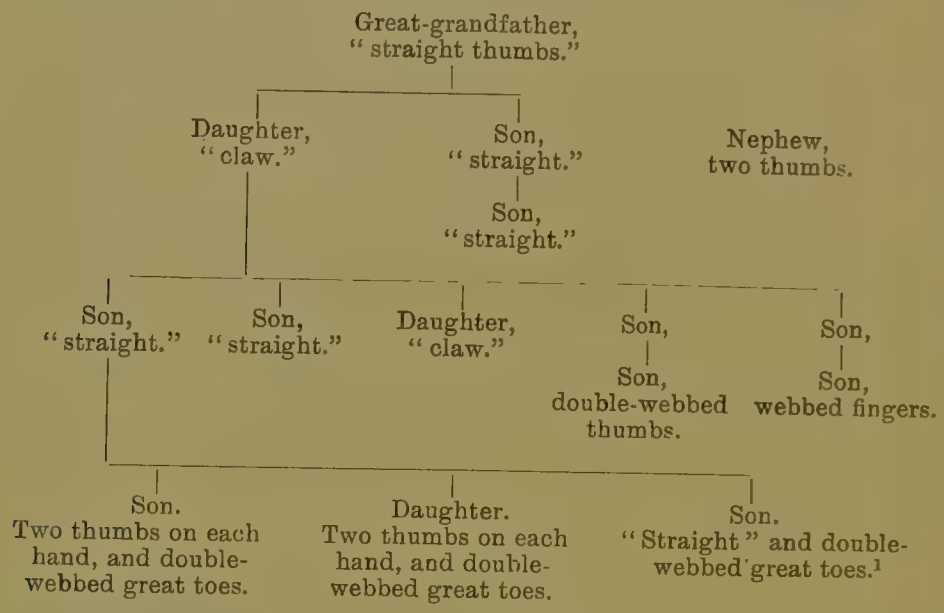
There are certain outstanding points, however, on this subject with which medical men ought to be acquainted.

In the skull of the lower animals the *foramen magnum* is placed farther back, and the posterior edge of it is turned more upwards, than in Man. In all the lower animals, there are two more bones in the face, viz.: the inter- or pre-maxillary bones; and none of the lower animals possesses a protuberance at the chin. The dorsal vertebræ are, generally, more numerous in animals. The pelvis is narrower, more elongated, and its brim, more oblique. The sacrum is also narrower. Many of the lower animals do not possess clavicles: Apes have them, however, as also those animals which have prehensile hands, or fore-limbs adapted for swimming or paddling, but, even then, they are not so perfect as in Man. The sternum, in many animals, is flattened or rounded from side to side, not from before backwards as in Man. That of the orang-outang, however, is not unlike that of Man, although it is thinner, narrower, and its constituent bones are more widely separate. The infrascapular fossa is much more marked in animals than in Man. The human humerus is relatively shorter than that of animals in many cases. The carpus in some of the apes has one more bone than that of Man. The femur of the bear and the tibia of the orang-outang are very like to those of Man. The fibula of animals is often but imperfectly developed. The tuberosity of the *os calcis*, in the lower animals, is little developed as compared with that of Man, and this feature, probably more than any other, distinguishes him as a plantigrade animal. For further details, consult Owen's "Comparative Anatomy of Vertebrates," vol. ii.

IV. With Reference to Bodily Deformities or Peculiarities.—So far, these have been already considered in treating of scars and tattoo marks. But there are other deformities or peculiarities which are noteworthy; such as moles, warts, nævi, congenital hare-lip, cleft palate, congenital deformity of hands or of other parts of the body, such as defective development of the ribs; sexdigitalism; supplementary mammæ; artificial indentures, and tooth-stopping; effects of old disease in joints; old dislocations; fractures; occupation markings; and others which need not specially be enumerated. Most deformities or peculiarities may be considered as due to deficiency or exuberance of development. To the former, belong hare-lip, cleft palate, defective development of ribs, and defections in the anatomical perfection of the hand or foot, such as absence of fingers, or *webbed* fingers or toes. To the latter, may be relegated supplementary mammæ, and sex-digitalism or supernumerary fingers or toes, the latter of which is distinctly an hereditary phenomenon. Dr. Young[1] has recorded a singularly interesting case of this, in which he was able to trace the hereditary defect through four generations, and to demonstrate that the original possessor of the deformity had transmitted it to eleven male and female descendants. We have also notes of a case in which we were able to trace it in the male line only for three generations.

[1] *B. M. J.*, Sept. 10, 1898, p. 715.

In Dr. Young's record, the great-grandfather possessed what the family called "straight thumbs," the anatomical characteristics of which were these: the terminal joint of the thumb was ankylosed, the phalanges were broad, "as if two thumbs had been begun to be formed, producing, however, single flat phalanges with a single broad nail; the first phalanx, moreover, is longer than normal, while the terminal phalanx is short." Associated with this original deformity, in succeeding generations, was either a repetition of the original deformity, or the existence of two separate thumbs, or "claw" thumb, with webbed fingers, or toes. The following is a chart given by Young illustrative of the progressive family history of the deformity:



Mistaken Identity.—In spite, however, of the clue to identity which such deformities ought to give, it is very remarkable how mistakes do arise therefrom. The following cases are illustrative: Dr. Kinloch[2] narrates the facts of a case which shows how this mistake actually arose. The body of an old man, having the forefinger of the left hand and the left ear awanting, was found on the banks of the river Dee. The body was claimed by two young women as that of the

[1] For other references to deformities of other kinds, consult:—

B. M. J., July 22, 1899, p. 253
do. May 13, 1899, p. 1150
do. July 1, 1899, p. 58
do. Dec. 3, 1898, p. 1732
} Deformities of Ribs.

Geipel (*Munch. med. Wochens.*, March 7, 1899), Congenital Absence of Shoulder and Arm Muscles.

Virden (*Pediatrics*, vol. vii. p. 351), Congenital Displacement of Scapula.

Mazzitelli (*Archiv. di. Ortoped.*, Ann 15, f. 5, 98), Congenital Absence of both Fibulæ (120 cases).

Appert (*France Méd.*, May 26, 1899), Cardio-thoracic Malformations.

B. M. J., July 29, 1899, p. 273, Rare Abnormality of Mouth.

Cautley, *B. M. J.*, Aug. 19, 1899, p. 468, Abnormal Ossification of Parietal Bones in an Infant.

Salt, *B. M. J.*, Mar. 3, 1900, p. 509, Supernumerary Nipple.

Templeton, *B. M. J.*, May 6, 1899, p. 1089, Axillary Mamma.

[2] *Edinburgh Medical Journal*, Feb. 1854.

body of their father, he having the like deformities, and, also, a proclivity to wander from home. They buried it as the body of their father. On returning from the funeral they had to cross a ferry. The ferryman interrogated them for whom they were mourning, to which they replied, they had just come from burying their father. He said that surely could not be, as half-an-hour before, the old man, their father, had crossed with him in his boat. On their arrival home, they found their father awaiting them. A few years ago, the dead body of a woman was found on a public highway and was taken to Johnstone for identification. The first claimant of the body was a woman who thought the body was that of her mother who had been amissing for nine months, but she was unable to identify the clothing on the body. The second was a man from Paisley who believed the body was that of his mother, in which belief he was corroborated by his sister, who, after seeing the body, likewise declared it to be her mother's body. They made arrangements for burying the body, and had it put into a coffin. Just as they were removing the coffin, a man arrived from Port-Glasgow who expressed a strong wish to see the body; because his mother-in-law had gone amissing. As the coffin was screwed down, he was first asked to examine the clothing, after which, he declared that the clothing was that of his relative, as he specially recognised the

FIG. 30.—Sexdigitalism or Supernumerary Digits.

We are indebted to Dr. Edgar W. Sharp—a former student—for the use of this photograph.

The two extra digits are articulated with the distal end of the metacarpal bones of the respective thumbs. The left extra digit had three phalanges, the terminal one being rudimentary; the right had only two phalanges. Each had a distinct arterial supply, a rudimentary flexor tendon, and a finger-nail. The deformity was hereditary. The father had one extra digit arising from base of right thumb; one of his sisters—the boy's aunt—had the like deformity; but the rest of that family—nine in number—were free from it. One of the brothers of the boy's grandfather, however, had the same deformity.[1]

[1] *B. M. J.*, vol. ii. 1901, p. 714.

new shoes with which he had provided her shortly before she left his house. An altercation thereupon ensued between the claimants for possession of the body, until at last the supposed daughter declared that her mother had an ulcer on the leg, which would decide the matter. The body being then examined, and no ulcer being found, she had to forego her claim, and the man from Port-Glasgow was left in possession of it; and he interred it as the mortal remains of his mother-in-law. A third case which occurred in Dublin in December 1897 is even more remarkable. The dead body of a woman was taken out of the canal, and was identified by a man and some neighbours as that of the man's wife; the three sons, however, declared it was not the body of their mother, because of the colour of the hair. An inquest was held, and a verdict was returned of "Found drowned." The body was interred by the family, and some insurance money was paid over by a burial society. But to the amazement of the husband and family, the wife and mother returned home after her supposed interment, hale and hearty. What doubtless helped to the mistake in identity in this case was the fact that the deceased and the person for whom she was mistaken had the like accidental marks over the eye and on the nose, and each had the same number of teeth awanting.

While the foregoing cases read more like fiction than fact, they are but typical of many like mistakes. Such mistakes usually arise only when the facial features are changed past recognition, most usually in the case of bodies that have lain in the water for some time; and also, from the desire of mourning relatives to satisfy their grief by interring *a* body. On the skeleton itself there may be left such marks as may lead to identification; for example, the body of Dr. Livingstone—the celebrated missionary and African traveller — was identified on its arrival in this country by the ununited fracture of the humerus which had resulted from the bite of a lion occasioning his remark on the incident that the lion "shook me as a terrier dog does a rat." In the same way diseases of bones of joints, fractures of the skull from violence, or badly united fractures of long bones may leave such marks as may lead to identification when the body has been reduced to a skeleton. The only occupation-marking which leaves a permanent deformity on the skeleton is that of shoemakers from the pressure of the last—a deformity, however, which is becoming rarer from machine-making taking the place of hand-making—and which consists in a marked indentation of the sternum.

The following random cases from our notebook indicate how identity may be established in cases of drowning where decomposition has far advanced:—

1. J. M.—by a black band worn on left wrist;
2. J. P.—by the right hand being awanting from a former accident;
3. H. W.—by the left leg measurements being less than those of right, owing to the use of a crutch for some years in childhood when suffering from disease of left ankle. The calf of left leg measured 1½ inches less in girth than the right;
4. A. W.—by congenital hare-lip, which had been operated upon when an infant;
5. J. H.—a tailor, by a bunch of black thread found on neck of coat, pins in lapel of coat, and tailor's thimble on finger;
6. G. W.—by the left leg being bandaged from ankle to knee.

As instancing how identity may be established from a variety of sources, the classical case of the murder of Dr. Parkman by his fellow-professor, Webster, in Boston, U.S., may be cited. The latter had borrowed money of the former, who was last seen entering the laboratory of Webster for the avowed purpose of getting repayment. When his absence from his usual haunts became noticed, the friends of Dr. Parkman put the matter into the hands of the criminal authorities. The laboratory of Webster was searched, and in it were found the haunch bones, a thigh, and a leg, all of an adult, and, in addition, in the refuse of the laboratory furnace, fragments of skull bones and artificial indentures were found; and in a tea chest in Webster's possession, the trunk of a human body, and a thigh which corresponded to the one already found. The parts being anatomically pieced together, it was concluded that they were those of a man measuring about 5 ft. 11 in.; from the condition of the bones found, that they were parts of the body of an elderly man; and from an examination of the artificial plates of teeth by the dentist of the deceased, who was able from a peculiarity in them to fit a marked irregularity in the left side of Dr. Parkman's jaw, that the body was that of the missing man. The identity thus established was substantiated later by the confession of the accused, who suffered for his crime the extreme penalties of the law.

CHAPTER V.

DEATH: IN ITS MEDICO-LEGAL RELATIONS.

It is difficult to define death otherwise than the cessation of life. Death of the individual is termed *somatic* death, and death of the tissues, *molecular* death. But these do not happen consentaneously: molecular life remains for a variable period after the occurrence of somatic death. In considering many phenomena in connection with violent, or what may be termed, medico-legal, forms of death, it is of the utmost importance that this fact should be continually kept in recollection. Moreover, it throws light upon the phenomena of death itself. It is sometimes alleged that so uncertain are the earlier signs of death that not infrequently, in the opinions of those who make this assertion, persons are interred alive. Such persons urge, therefore, that no body ought to be interred until putrefaction has definitely declared itself, and that, until this is shown, bodies ought to be retained in mortuaries. From a careful study of the facts put forward, we believe that the allegation is practically baseless, and, in any case, that it has been founded upon very insufficient and inadequate data.[1] In temperate climates, and, more certainly, in rigorous winter climates, bodies are usually kept for such a sufficient period after death is reckoned to have happened, that the fear of live interment may be lightly brushed aside. In Canadian towns and cities in winter, for example, where the ground is so frost-bound that inhumation is impossible, and where, in consequence, bodies have to be stored in suitable places until interment becomes possible, the non-occurrence of live interment is placed beyond doubt. Even in hot climates where early interment is the rule because of the rapid onset of putrefaction, there is little chance, where the body is kept a reasonable time compatible with safety to the living, for live interment to occur. We do not assert that live interment is absolutely impossible, but we do state that its occurrence can be extremely rare, and, further, that indubitable evidence of the fact has been but rarely recorded. "The Premature Burial" of Edgar Allan Poe, blends fact and fiction so ingeniously that the casual reader may be left with the impression that the occurrence is comparatively common. That there have been odd occasions of live interment in states of suspended animation, there is reason to believe, but, on the other hand, many of the facts recorded of other cases as evidence of live burial, are quite explicable by post-mortem phenomena. A class of persons exists, however, in whose minds the morbid dread of being buried alive is a source of much anxiety, and such are within

[1] *Med. Times and Hospital Gazette*, Mar. 17, 1900. *B. M. J.*, Jan. 16, 1897, p. 159. "Premature Burial: Fact or Fiction," Walsh, 1898. *Medico-Legal Journal of New York*, June, 1898.

their right in exacting that such precautions should be taken as to prevent its occurrence. We go further, and say that in the case of every supposed death, satisfactory proof of its occurrence ought to be given, in a way to be afterwards discussed. But little sympathy can be extended to the hysterical efforts which have been made from time to time to excite the public mind in this direction. The precautions which have been suggested ought to be taken have met with little sympathy in this country, but in America they have borne fruit.

A Bill to Prevent Premature Burial was introduced into the Legislature of the State of New York on March 4, 1898, in which it was proposed (1), to make it compulsory that in all cemeteries, crematories, or other places for the final disposal of the dead other than by embalming, in places of 10,000 inhabitants or upwards, or wherein the number of bodies to be disposed of should amount annually to one hundred or more, mortuaries should be erected in which the bodies to be finally disposed of should be placed, which should be kept at a temperature of between 60° and 70° F., and in constant attendance upon which there should be a physician and other persons; (2), that no body should be finally disposed of before the lapse of 72 hours after the time of death as certified by a duly qualified physician or coroner; (3), that the certificate of the said physician or coroner should bear that he had made the following tests on the body to determine the existence or non-existence of death, viz.:—

1. That he had made two or more incisions in one or more of the arteries of the deceased and that no blood flowed therefrom;
2. That he had applied a test to the web of the fingers to discover the absence of translucency (test given in detail in the Bill);
3. That he had proved the absence of respiration by a mirror held before the lips and nostrils;
4. That he had applied to the skin of the deceased in two places a piece of red-hot iron or steel for at least ten seconds, and that no blister had formed; and
5. That he had examined the body of deceased and had found mucus covering the eyes thereof.

After the receipt of such a certificate and the expiry of the 72 hours, and only then, the body may be finally disposed of.

We are inclined to apply to the above Bill a term which is not unknown in American politics, viz.: freak legislation, and this for a variety of reasons, the chief of them being that in France and Germany where such mortuaries and other arrangements exist—called in the latter country, the Leichenschauer system—not a single case has been recorded in which a body deposited therein as dead has returned to life.

The point at which prevention would be most easily and efficiently accomplished is in proper verification of the death in every case, which fact ought to be certified in every certificate of death.

SUSPENDED ANIMATION.

Suspended animation, which might by imperfect observation, be mistaken for death, may take one of three forms, or, in other words, it may proceed from one of three causes, viz.: (1) *Syncope;* (2) *Asphyxia;* (3) *Trance.* Probably the first and last named are the commonest. John Howard, the prison philanthropist, speaks of the resuscitating effect of cold air on a person who was being carried out for burial. The causes for such conditions will be better understood if the sanitary condition of the rooms of the sick in those days are inquired into; ventilation was then unknown in the sick-chamber. In Asphyxia, at a certain

stage of the process from whatever cause arising, suspended animation supervenes, due to the surcharging of the blood with CO_2 gas. It is one of the perils of the fœtus during child-birth. The following is a very instructive case of that kind. Dr. Taylor of Leith,[1] gives an account of the delivery of a child, breech presenting, in which difficulty arose during the birth. On examination of the cardiac region of the inanimate child after delivery no sound could be heard, or pulsation felt. Concluding, therefore, that the child was dead, the body was wrapped in a sheet and placed beneath the bed, while he continued his attention to the mother, whose condition remained critical. Dr. Taylor waited at the bedside of the mother till 1 P.M.—the child having been born at 11 A.M.,—and was about to leave the bedside, the woman being now out of danger, when he fancied he heard a rustling noise beneath the bed, which at first he thought was due to mice; on the sound being renewed, he brought out the body of the child and looked at it, and was about to replace it, when he observed "a quivering of the muscles." Believing the child to be still alive, he began artificial respiration and other resuscitating measures, and at 2.30 P.M., was able to hand over to the nurse a living child.

The condition of Trance is said, by most writers, to be associated with hysteria, and is, therefore, more commonly met with in females. The name covers a variety of conditions, the essential basis of which, however, is low vital action. The body of the victim of it becomes motionless, there is complete insensibility, and although respiration and circulation seem suspended, careful search for the evidence thereof will reveal their presence, though in a very feeble form. It is, therefore, a state which might easily be mistaken by a lay person for death; but the maintenance of the animal heat (although subnormal temperature is the rule), the response of muscular irritability to stimuli, and the absence of the onset of *rigor mortis*, ought to satisfy a medical man that death has not occurred. The most notable case of this kind was that of Colonel Townshend.[2] This gentleman had the power of voluntarily suspending the action of his heart. He submitted himself to this experiment while observed by Drs. Cheyne and Baynard and Mr. Skrine. While in this state these observers could find no evidence of breathing,—a bright mirror was unsullied when applied to the mouth, —nor any pulsation at wrist or heart. After the person had been in this state for about half-an-hour, the observers were on the point of leaving—thinking him dead—when they observed a slight motion of his body; and then on examining the pulse, they found that the heart had resumed its function, and, shortly after, the Colonel began to breathe gently and to speak. He died, however, that same evening. Necropsy of his body revealed nothing abnormal, except disease of the kidney. In this connection, too, are the feats of Indian Fakeers in suspending animation. The student who is interested in this subject ought to consult an article entitled, "A Study in Apparent Death,"[3] wherein are recorded many interesting facts on the subject apparently beyond the reach of trickery.

[1] *Glas. Med. Journal*, vol. xiv. p. 280.

[2] Cheyne's "English Malady: Or a Treatise on Nervous Diseases," 5th Edit. 1735, p. 307.

[3] *Scribner's American Monthly Magazine*, Dec. 1880.

PROXIMATE CAUSES OF DEATH.

All deaths, by whatever name we designate them in our nosology, or from whatever disease or violent cause arising, may be resolved into one of three proximate causes or sources, viz. :—

I. Death beginning at the Brain, called *Coma.*
II. „ „ „ Heart, called *Syncope.*
III. „ „ „ Lungs, called *Apnœa*, or *Asphyxia.*

Life being maintained by the interdependent action of these three organs which were termed by Bichât the tripod of life, the arrest of the function of one of them is quickly succeeded by the arrest of the function of the others, and life ceases. The proximate causes of death may, therefore, be denominated (1), Coma; (2), Syncope; and (3), Apnœa or Asphyxia. There are, however, good reasons for saying, from clinical observation and post-mortem appearances alike, that there ought to be added a mixed form due to the combined effects of the first and last named, viz. : *Comato-Asphyxia.*

I. Coma, or Death beginning at the Brain.—The arrest of the functions of the brain may be due to a variety of causes. Of these, the following are the chief :—

1. Compression of the brain : from
   (*a*) Depressed fractures of vault of skull;
   (*b*) Hæmorrhagic or serous effusions, as in Apoplexy, Hydrocephalus, or Hæmorrhage in Fracture of Base of Skull;
   (*c*) Tumours.
2. The Effects of Narcotic and other Poisons.
   These poisons may be subdivided into two classes, viz. :—
   A. Those which are introduced into the body from *without* :—
   (1) Vegetable poisons, as opium and its preparations; many vegetable alkaloids; some ptomaines.
   (2) Mineral Poisons, as Arsenic, Barium, Oxalic Acid (in certain doses), and Carbolic Acid.
   B. Those produced *within* the body during the currency of certain diseases of liver and kidneys—Autogenetic poisons—as in
   (*a*) Uræmia, in Bright's disease;
   (*b*) Cholæmia, in Jaundice;
   (*c*) Acetonæmia, in Diabetes Mellitus.
   C. Mixed Causes, which begin in the brain, but which chiefly affect the action of heart or lungs, or both, as in Concussion, so-called—but in which cases there is likely to be injury to brain substance.

The condition of Coma may exist for some time before death ensues. The characteristic symptoms are as follows :—

(1) More or less profound stupor;
(2) Absence, or imperfect perception, of sensory impressions;
(3) Suspended, or imperfect, operation of intellect;
(4) Imperfect action of reflexes, shown by accumulation of mucus in air-passages, and relaxation of sphincters.

By reason of the interference with the respiratory function, the

post-mortem signs resolve themselves into a combination of both proximate forms of death,—Coma and Asphyxia—hence the name Comato-Asphyxia.

Post-Mortem Appearances are:—

1. Hyperæmic condition of Brain and Spinal Cord, and their membranes.
2. Signs of Asphyxia.
3. Brain Lesions.

II. Syncope, or Death beginning at the Heart.

Causes.—1. Sudden cessation of the action of Heart, due to—

(*a*), Shock; (*b*), Emotion; (*c*), Blows on head or epigastrium; (*d*), Drinking large draughts of Cold Water when over-heated; (*e*), sudden evacuation of fluids, natural or pathological, from the body, as in emptying an over-distended bladder, or tapping a large hydrocele, an ascites, or pleural effusion.

2. Deficiency of Blood due to Exhausting Hæmorrhages.
   (*a*) Uterine hæmorrhages;
   (*b*) Bursting of varicose veins during sleep;
   (*c*) ,, ,, aneurysms;
   (*d*) Wounds of Heart or large blood-vessels.

If an animal be bled to death and the heart be examined immediately thereafter, it will be found contracted, as the organ goes on contracting until sufficient stimulus—the blood passing through it gradually lessening in amount—is lost to cause it longer to contract. The deaths of Lord Frederick Cavendish and Mr. Burke in the Phœnix Park murders, 1882, were due to syncope, caused, in the former, by severance of the right axillary blood-vessels, and, in the latter, by a penetrating wound of the right ventricle of the heart.

3. Result of Exhaustive Diseases;—in which may be included all chronic diseases; infective diseases, etc.
4. Extensive Injuries to Body from Mechanical Causes, such as Accidents on Railways and by Machinery,—the "neuro-paralytic" death of the German school.
5. Heart Diseases—of the degenerative type.

Symptoms.—These may be observed during temporary syncope, as in (*a*), fainting, or (*b*), the currency of a fatal hæmorrhage. In (*a*), the sufferer usually falls motionless; the face is pale; pulsation disappears from wrist; respiration ceases. In a few seconds, however, symptoms of return of consciousness assert themselves. In (*b*), there are cold sweats; the vision becomes dim; the pulse becomes quick, weak, fluttering; there may be vomiting; jactitation of limbs; passing delirium; irregular sighing respiration; convulsions may appear; death succeeds.

Post-Mortem Appearances.—In sudden cessation of the heart's action, the heart conditions, with respect to contained blood, will vary with the cause of the cessation of function. If it be due to exhaustive hæmorrhage, the respective cavities of that organ will contain comparatively little blood, and there will be a relatively bloodless condition of the organs of the body, and of the skin. If due to disease of the heart itself—degenerative changes in the heart muscle,—the cavities respectively are likely to contain normal quantities of blood. The brain and

lungs are not engorged with blood. It is stated by some observers[1] that in death from shock "the heart is quite empty, and the blood accumulates in the abdominal veins." Our observations from post-mortem examinations compel us to say that it would be more correct if the condition of the heart were described as "comparatively empty." The post-mortem appearances found after penetrating wounds of the heart will be discussed under the head of Wounds (*vide postea*).

III. Apnœa or Asphyxia, or Death beginning at the Lungs.—Almost every writer who would be a reformer in medical nomenclature has raised valid objections to the term asphyxia to denote interference with respiration.[2] Literally, the word means—*pulselessness*, or *want of pulse*. They would prefer the word Apnœa, which means want of breathing. In this, we agree; but, unfortunately, the term apnœa has been utilised by physiologists to signify cessation of respiration in an animal while the blood is kept oxygenated by artificial respiration. The term asphyxia is consecrated by long use to signify interference with respiration, and it would only introduce confusion were the former term to be substituted for the latter at this time of day.

CAUSES.—These may be divided into 1. External; 2. Internal.

1. *External.*
   - *A. Natural or from Disease.*—(1) Anything that causes occlusion of the air-passages by mechanical action. Internally: Foreign bodies; membranous exudations; tumours, etc.
   - *B. Accidental.*—Anything which causes mechanical impediment to respiratory function by exercising pressure on chest walls; as pressure in panic-stricken crowds, falls of débris in such occupations as that of quarryman, miner, collier, navvy, gravedigger, sand-pit labourer, builder.
   - *C.* Violent Causes: as Strangulation, Suffocation, Hanging, Throttling, Drowning, Penetrating Wounds of Thorax, Inhalation of irritant gases, or CO_2, CO, or coal gas.
   - *D.* Rarefaction of atmosphere, as in ballooning.
2. *Internal.*
   - *A.* From causes operating upon the nervous system:—
     - (*a*) Paralysis of respiratory nerves, or of respiratory centre from injury or disease; or from the action of such poisons as woorara and conia.
     - (*b*) Fixation of respiratory muscles from over-stimulation of spinal cord, as in strychnia and nux vomica poisoning.
     - (*c*) Causes operating from the lungs or pulmonary circulatory system: (1) Lung diseases generally; (2) Pleurisy with Effusion; (3) Empyema; (4) Pneumothorax and Hydro-pneumothorax; (5) Pulmonary apoplexy; (6) Embolism or Thrombosis of Pulmonary vessels.

SYMPTOMS.—If the respiration be suddenly cut off, external movements cease within three to five minutes, but the heart continues to beat for some minutes thereafter. Depending upon this fact is the chance of resuscitation of those who though asphyxiated are not yet lifeless.

[1] Guy and Ferrier's "Forensic Medicine," 5th Edition, p. 265.
[2] Watson's "Principles and Practice of Physic," vol. i. pp. 59–75.

The phenomena of asphyxia are essentially those of carbonic acid poisoning, viz.: restlessness, increased respiratory action which gradually becomes more violent, and lividity of lips being the main symptoms. Unconsciousness supervenes when CO_2 gas begins to accumulate in the blood-vessels and re-aeration of the blood in the lungs is prevented.

POST-MORTEM APPEARANCES.—

EXTERNAL.—1. Livid markings on skin; 2. Marked condition of post-mortem lividity which is of a dark colour; 3. Lividity of lips, varying in colour from pale-blue to almost black; 4. Normal, or semi-protruded state of tongue; 5. Face generally may be either calm and placid in expression, and normal as to colour (usually seen after death), or it may be distorted, much congested, and livid, with frothy muco-sanguinolent fluid coming from mouth and nostrils, with also congested conjunctivæ; 6. Lividity of finger- and toe-nails, usually well marked in infants and young children.

INTERNAL.—*Chest:* 1. The lungs are engorged with blood dark in colour, and on section, they give a plentiful, dark-coloured, frothy, bloody exudation; and in infants, from overlaying, some of the air-vesicles on the marginal surfaces of the lung may be found ruptured; 2. Punctiform ecchymoses may be seen on costal or pulmonary or pericardial pleura; 3. In the windpipe a cinnabar-red coloration of the mucous membrane will be seen, which may vary in extent from branch-like patches to uniform coloration of the whole mucous surface.

Heart.—1. The cavities of the right side are engorged with dark-coloured, imperfectly clotted blood; 2. the venæ cavæ are likewise engorged; 3. the cavities of the left side are empty, as is also the arterial system. MacWilliam affirms that the blood-distribution seen in the heart after death is a post-mortem development, due to *rigor mortis* in the heart muscle; that the left ventricle on the onset of *rigor mortis* expels its contained blood—which he alleges is present originally in amount equal to that of the right ventricle—with a marked and measurable degree of pressure; and that the right ventricle contents remain because the muscle composing its walls dies slowly and gradually, and does not, therefore, exercise this expulsive pressure.[1]

Other Bodily Organs.—1. Abdominal viscera show venous congestion; 2. the brain is very often congested, although not so markedly as in death from coma; bloody points, however, may be seen on section of brain substance, and there may be serous effusion into the ventricles.

Blood.—The blood, generally, is dark in colour, and is mostly fluid in the large veins: clots may be met with in the heart, but they are not firm in consistence.

From the foregoing signs, therefore, it will be apparent that death by asphyxia resolves itself into death from excess of CO_2 in the blood. Interference with the due aeration of that fluid prevents its oxygenisation, hence CO_2 accumulates in it. This increasing, the CO_2 in the arterioles causes contraction of these vessels thereby throwing in-

[1] *B. M. J.*, vol. ii. 1901, p. 1078.

creased action upon the heart, and, by reflex action, causing increased action of the respiratory muscles through the respiratory centre in the brain. But the CO_2 still accumulating, the respiratory centre is deadened, respiratory action becomes more weakened and fitful, and ultimately ceases after gradually increasing intervals between the respirations—the heart, however, continuing to beat for some minutes after respiratory movement has finally ceased.

SUDDEN DEATHS.

Death may supervene very rapidly and unexpectedly. It would appear as if the suddenness of death is more frequent now than formerly; but whether this is due merely to the more common recording of the facts, it is difficult to say, because owing to the registration of the causes of such deaths under distinct diseases, it is impossible to differentiate between those which occur suddenly and those which take place after longer or shorter periods of illness. It will probably be not far from the mark to say that at least one per cent. of all deaths may be ascribed to sudden causes. Popularly, it is supposed that all deaths of this kind are due to cardiac disease, but this is not scientifically correct.

Sudden deaths arise from a variety of causes, of which, probably, cardiac disease is one of the chief. The different causes may be grouped under the following heads, viz. :—

I. Diseases of the heart, including angina pectoris, valvular diseases with imperfect compensation, degenerative changes of the fatty and brown types in the heart-muscle, and the conditions which may arise therefrom, as rupture of muscular tissue or of valves.

In such cases, excitement, excessive emotion, and blows of a trifling character delivered under exciting circumstances may produce sudden death. We have made examinations of bodies of three persons in whom death occurred during a scuffle or after a blow had been struck. In two of the cases, valvular disease sufficient to account for the death was found, but in the third—that of a young man who had never been robust—no cardiac lesion was discoverable. There can be little doubt that syncope alone may account for death in certain cases; due, in some way, to interference with cardiac innervation.

II. Diseases of the main blood-vessels, such as aneurysms and thrombosis. Rupture of aortic or abdominal aneurysms causes almost instant death, while rupture of intra-pericardial, intra-cranial, and other aneurysms of small vessels are also likely to cause death, but probably not so rapidly as the former. Sudden deaths from thrombosis of large vessels during the puerperal condition are by no means uncommon after delivery. Idiopathic hæmorrhages within the cranium may be distinguished from those produced by violence by the situation of the effused blood relatively to the meninges of the brain; in the former they are usually within the membranes or in the brain substance, whereas in the latter, they are commonly found between the membranes and the bone. It must not, however, be forgotten that hæmorrhage which is due to violence may be found on the surface

of the brain, but in such cases, some measure of bruising or laceration of brain tissue will usually be found. In all cases where there is any doubt, the parts must be carefully dissected to discover the presence or absence of a ruptured artery;

III. Brain hæmorrhages, as in apoplexy. Death may occur rapidly in cases where the hæmorrhage is extensive or is situated in the Pons Varolii, or in the cerebellar region; death may happen suddenly, also, from hæmorrhage consequent upon rupture of varicose veins during sleep (*vide post.*);

IV. Certain lesions of Lungs, as pulmonary apoplexy, hæmorrhage from ruptured vessels in phthisical cavities, and in hæmatothorax, or even in pneumothorax following chronic lung diseases;

V. Perforating ulcers of stomach, or of other part of the alimentary tract. Death occasionally follows the drinking of large draughts of cold fluids when persons are over-heated;

VI. Certain conditions associated with pregnancy, as rupture of the sac of an extra-uterine pregnancy, rupture of the uterus itself during labour, and uterine hæmatoceles;

VII. Rupture of internal organs from degrees of violence, as of a hyper-distended bladder, of gall-bladder, of intestines, or of any solid viscus. Such ruptures occur, very frequently, without any external marks of injury on abdominal wall being discoverable;

VIII. Foreign bodies in the pharynx or air-passages. We have examined several bodies in which liquid, solid, or pultaceous substances have been found in the air-passages and which have, probably, regurgitated into these channels during the act of vomiting, or have become impacted in swallowing, while the persons were intoxicated. In one case, in which the assailant was charged with culpable homicide, a vinous liquid—probably beer—was found in the trachea and air-passages of the victim.

IX. Nervous seizures. While it is not usual for death to follow epileptiform seizures, it has to be borne in mind that fatal results do occasionally happen, particularly when the cause is uræmia. In infants and young children fatal issues sometimes quickly ensue from *laryngismus stridulus.* This must be kept in mind during inquiry into cases of suspected overlaying.

In all cases of sudden death, while it is the duty in Scotland of the Procurator-Fiscal, and of the Coroner in England to determine how far inquiry into the causes of deaths should go, medical practitioners should hesitate, unless upon the strongest evidence, to certify as to any particular cause without a post-mortem examination of the body.

THE SIGNS OF DEATH.

The question of Death is of importance from different medico-legal points of view. It arises in answer to the queries, Is the person really dead, or only apparently dead? and, again, If dead, how long time has elapsed since the occurrence? Usually, in addition to these, is a third query, viz.: What was the cause of the death? But the discussion of this last query will be deferred until later.

Has Death taken place, and if so, How Long Before?

In cases in which the last sentence of the law has been carried out, it is part of the duty of the surgeon of the prison in which the execution has been performed to certify that the person is dead, in terms of the sentence that "he be hanged by the neck till he be dead." And in the cases of those who labour under the fear of premature interment and who have given special instructions in their wills for certain tests to be used before the body is committed to the grave, the duty of certifying that death has actually taken place will fall upon the physician. There are other circumstances, moreover, in which, soon after apparently sudden demise, the duty of saying whether or not death has occurred will be demanded of a physician. This question, obviously, is attended with some difficulty only in such cases as the last named; for where some time has elapsed, a lay person may be equally competent to pronounce an opinion. Every sign of death, therefore, is of importance when considered relatively to the supposed time of its occurrence. It will be well, therefore, to consider these signs in their chronological order.

The first in point of time are:—

I. Cessation of Respiration and Circulation.—The former may be tested by—

(*a*) Auscultation;
(*b*) Placing a hand-mirror before the mouth or nostrils; or a light downy feather; noting bedewing or movement;
(*c*) Placing a saucer full of water on the chest or abdomen, and observing presence or absence of rippling of water therein (Winslow's test);

The latter, by—

(*a*) Auscultation;
(*b*) Manual exploration of principal arteries, as carotids, for pulsation, or thrill;
(*c*) Applying a ligature tightly round a finger, and observing whether or not a bloodless zone forms at the seat of the ligature and a zone of livid redness on its distal side (Magnus' test);
(*d*) Applying pressure to the finger-nail and observing whether or not at the moment of application of pressure the nail becomes white, and on relaxation of the pressure, again becomes pinkish-coloured;
(*e*) Dropping a spot of melted sealing-wax on the forearm, and observing whether or not redness or vesication ensues;
(*f*) Holding the web of the fingers against a strong light, natural or artificial, and observing whether the web is translucent or not;
(*g*) Inserting a bright needle deeply into a fleshy part of the body and observing whether it is tarnished or not on withdrawal after it has been allowed to remain *in situ* for about ten seconds;
(*h*) Injecting hypodermically a solution of Fluorescin (resorcin-phthalein and sodium bicarbonate,—a gramme of each

dissolved in 8 c.c. of water) (Icard's test).[1] Where cessation of circulation has occurred, no local discoloration of tissue results; but if circulation still continues, a yellowish-green coloration of the skin will take place round the injected part, and the substance may be detected in the blood at some distance from the part injected by pricking the skin. By immersing some white silk threads in the blood and afterwards boiling the threads with water in a test-tube, a greenish coloured solution will result which will dye the threads.

The absence of reaction to these tests, or to some of them, five minutes after death is supposed to have taken place, will betoken the occurrence of death. In cases of suspected suspended animation, these tests will detect also whether the circulation still continues or not. It is of the utmost importance that the examiner should differentiate between *systemic* or *somatic* and *molecular* death, for although the former has occurred, there may be certain response to some of the above tests by reason of the continued existence of the latter.

II. Loss of Lustre of the Eye.—This usually takes the character of a glazed appearance. Later, the eye-ball becomes covered more or less with mucus. According to Guy and Ferrier,[2] in deaths from Apoplexy, Carbonic Acid, and Prussic Acid, "the eyes may continue brilliant and prominent for a long time," and, according to Nysten,[3] the same result is produced from distension of the body with gas. From the examination of a large number of bodies, however, especially where death was due to the first two causes named, we have not been able to corroborate this conclusion, nor have we seen the result spoken of by the last observer.

So long as molecular life remains in the tissues of the eye, atropine will dilate, and physostigmine contract, the pupils.

III. Effect of Stimuli on the Body.—After death, mechanical stimuli produce no result whether molecular life be present in the tissues or not; on the other hand, for a variable time after systemic death, and while molecular life remains, electrical stimuli cause some measure of response.

This phenomenon of the persistence of molecular life may be studied to some extent in a limb newly amputated. If the exposed muscle be pricked or irritated, contraction of the muscular fibres may be seen, and this will persist for a variable period after the removal of the limb from the body, the length of the period depending upon the proximity to the normal bodily temperature at which the limb is kept.

IV. The Skin of the Body becomes White or Greyish-White.—The reason for this is the cessation of circulation. To this rule, however, there are parts of the body which are exceptions, in odd cases; for example, in persons of florid complexion the colour is apt to remain even for a day or two over the malar prominences, due to the fact that in that situation the capillary vessels of the skin are unusually dilated. The livid or brownish colour of old ulcers, too, is

[1] *La Mort réelle et la Mort apparante*, 1897. [2] *Op. cit.* p. 246.
[3] *Archives Générale de Médecine*, June 1862.

retained, as is also the yellow or other colour of Jaundice. Tattoo marks also remain, as do also the colours of ecchymoses. In deaths from inhalation of CO gas, the rosy colour of the skin of face, of shoulders, of upper chest, and of inside of thighs is retained; as are also the red splashes on the surface of the body in deaths from cold and exposure. In certain cases of death by drowning, too, a rosy colour of lips and of malar prominences may also be observed (*vide post.*).

V. The Temperature of Body falls.—The loss of heat and the rapidity of the loss depend upon certain circumstances. It is due to the cessation of circulation and the consequent loss of oxidation of the tissues. Generally speaking, the rate of loss may be estimated at about one degree an hour on the average of time taken by the body to fall to the temperature of the surrounding medium; but relatively, the temperature falls most rapidly immediately after death, and more slowly the nearer it approaches the temperature of the medium. Usually speaking, the time which the process takes may be reckoned as between 8 and 12 hours. The important point to observe, however, is that the cooling of the body is progressively downwards.

The rate of cooling of the body is modified by the following circumstances:—

(*a*) *Condition of the body:* Fat bodies retain heat longer than thin ones; the bodies of strong persons longer than those of weak; and clothed bodies longer than naked.

(*b*) *Medium in which body is placed:* In ordinary water bodies cool more rapidly than in air; in putrescent fluids they retain heat longer than in ordinary water: the colder the medium, of course, the more rapid the cooling.

(*c*) *Kind of Death:* In deaths by lightning, and by suffocation, bodies retain heat for longer time. According to Nysten, in the latter form of death a body may take three days to cool down. In diseases, microbic in character—as in cholera, yellow fever, small-pox, and others—the temperature of the body may even rise after death, due to the multiplication of these organisms in the still living fluids and tissues of the body; and the same fact has been observed in death from acute rheumatism, injuries to the nervous system, and abdominal diseases.

VI. General Muscular Relaxation of the Body ensues.—This condition has been termed Primary Flaccidity to distinguish it from the condition of flaccidity which occurs after the departure of *rigor mortis.* During this condition, spasmodic muscular states ordinarily relax and disappear; but to this there is the important exception that weapons or other articles clutched in the hand at the moment of death may be retained firmly even through this condition of general flaccidity.

According to Casper,—and his conclusions accord with our own observations,—a body which presents the foregoing phenomena may be reckoned as having been dead for about ten to twelve hours at most.

VII. Loss of Elasticity of Eye-Ball: or Flaccidity of Iris.—This is due to the loss of tension which the fluids of the eye-ball undergo after death, and is characterised by the change of shape which the

ball assumes on synchronous pressure from two sides opposite to each other. Formerly, more importance than ought to have been was attached to this as indicative of the time of death. Observations have shown that it may be produced even before death.[1] The test seems to have originated with Ripault.

VIII. Contact Flattening of the Muscles.—The muscular system of that part of the surface of the body which is in contact with the medium on which it lies or has been placed after death, becomes flattened from pressure of the superincumbent weight.

IX. Hypostasis, or Post-Mortem Staining, or Cadaveric Lividity.—This phenomenon may be observed upon all bodies, no matter what may be the cause of death, even in deaths from hæmorrhage. The extent, colour, and incidence of the phenomenon varies in different cases. It is found upon that part of the body which is the most dependent with relation to the position of the body, and with relation to the different parts of the body; thus, in a body placed on its back after death, the lividity will be found on the dorsal aspect of the trunk, the posterior aspect of head and neck, the extensor surfaces of the upper limbs, and the flexor surfaces of the lower limbs. In bodies placed in positions other than this, the incidence of the lividity will be found accordingly; and so, from its distribution, it is possible to affirm as to the position in which a given body has lain after death. In medico-legal work, especially in cases where there are marks of violence on the body, the incidence of lividity ought to be carefully noted. While it is true, generally, to say that this coloration is to be found on the most dependent parts, it is to be noted that it does not appear upon those parts of the body which are in actual contact with the surface upon which the body is lying, even though these are dependent parts; nor does it appear in parts constricted, or under pressure, as, for example, under the site of the collar, or at the pressure marking of a waistband. The coloration may be said to be present on a body in the average case from 8 to 14 hours after death; we have seen it, however, as early as 5 hours, but this is exceptional. The phenomenon is due to the fact that the blood, like any other fluid when unacted upon by any counteracting force, obeys the law of gravity; hence the blood gravitates into those capillary vessels which are the most dependent in the body in the position in which it lies. And what is true of the external manifestations of hypostasis is equally true of the internal. In a body which has been lying on its back during the occurrence of its onset, the bases and back part of the lungs, the posterior wall of the stomach and the lowermost parts of the intestines, along with the kidneys, will be found similarly affected; and it is of great importance that the mere appearances of hypostasis in these organs should not be mistaken for phenomena of a different kind due to very different causes, such as lung disease, or poisoning.

Hypostasis, in respect that it is manifested by a discoloration, is liable to be, and has been, mistaken for subcutaneous extravasation of blood or ecchymosis, and hence a significance has, by mistake, been attached to it that may wrongously affect an accused person, in

[1] *Vide Brit. Med. Journal*, 25th Sept. 1880; vol. ii. 1880, p. 580.

respect that the result of a natural phenomenon has been interpreted as the effects of violence. By what means, therefore, may hypostasis be differentiated from ecchymosis? The best test which can be employed, and indeed the only one upon which absolute reliance can be placed, is by making an incision into the tissues through the centre of the discolored mark. If the discoloration be due to post-mortem lividity, only a few bleeding points from cut capillaries will be observable; but, if it be due to ecchymosis, blood—coagulated or fluid—will be found extravasated into the cutaneous and subcutaneous tissues. *In every case where an examiner is founding evidence of violence to a body on such discoloured marks, such an incision should be made.* It may be said that such is not necessary since the difference may be established by the respective colours. This is not possible in many instances, and therefore, it ought to be a routine practice before an allegation of violence is based upon such marks, that each place should be duly incised. The colour varies from a pale blue, through distinct blue, to a reddish blue colour; indeed, in some cases, it may even be of a blackish colour; hence colour alone is no guide. It has been given, as another difference between these, that a bruise is raised above the level of the skin and a hypostasis never; that is true of one stage in the history of a bruise, but only of the early stage; and it must be recollected that it is the colour, after all, which attracts attention, and not the swelling, which may have, indeed very probably has, disappeared. This hypostasis must not be confounded with the rosy colour imparted to the skin in Carbon Monoxide poisoning, which is additional to the other colour-markings on the body, although it imparts a hue to the usual lividity above described.

X. Cadaveric Rigidity or Rigor Mortis.—This phenomenon, which is also known by the name of Death-stiffening, occurs after death more or less in *all* bodies in which the tissues have reached some measure of maturity; it is doubtful if it occurs in the immature fœtus. It may, however, be seen in the mature fœtus which has died during the process of delivery; and right through all ages up to old age; but with a variability of time of onset and of duration, due to a variety of factors.

Rigor mortis is essentially due to intimate changes in the muscular system; it has no marked relation to the nervous system. If the nerve-supply to a given series of muscles be cut soon after death, the onset of *rigor mortis* in these muscles is not interfered with, except that the time of onset is somewhat retarded as compared with that of any other series of muscles the nerve-supply of which has been untouched. According to Bierfreund,[1] section of the ischiatic nerve of one side causes delay for some time in the appearance of *rigor mortis* in the muscles supplied thereby. The intimate change which occurs in the muscle to produce the stiffening is coagulation of the myosin within the sheath of each muscular fibre. When a living muscle is at rest, it gives a faintly alkaline reaction, but after contraction, the reaction becomes distinctly acid. During the state of *rigor mortis* the reaction is markedly acid, due to the presence of sarco-lactic acid, and, possibly, of

[1] *Archiv. für. dis. ges. Physiologie*, 1888.

other acids. Moreover, during this state, the sarcous elements become quite opaque, as seen on microscopic section. After *rigor mortis* passes off, the reaction of the muscles becomes alkaline. During the perfection of the *rigor mortis*, experiments have shown that a *limited contraction* of the muscle takes place; in other words, a muscle shortens in its length sufficient to lift a light weight; and there would appear to be a stage in the development of the phenomenon—for it must be borne in mind that this change is indicative of molecular life in the muscle—when, according to Brown-Séquard, the injection of defibrinated or arterial blood into a body will restore contractile power, under a stimulus, to the muscles. It is of much interest to inquire whether or not the intimate changes which occur in nerve fibres in their passage from molecular life to molecular death, coupled with the changes which occur in the same transition state in muscle, are not jointly involved in the complete development of the process. There is one thing quite clear, it appears to us, that any contractility which occurs in a muscle is not of the nature of physiological contractility, and, also, that deprivation of a muscle of its nerve-supply does not prevent the eventual onset of the stiffening, although it may retard it.

If an attempt be made to lift from the table upon which it lies the lower limb of a body in which *rigor mortis* is fully present, the general effect will be to lift the whole body as if it were simply a unified mass, and if the stiffened elbow of such a body be forcibly flexed, the flaccidity or mobility which results permanently remains.

There are, however, circumstances in which this rigidity does not ensue after death. In muscles which have been badly lacerated, for example, it does not supervene; and it is possibly for this reason that it has been affirmed generally of deaths by lightning, that *rigor mortis* does not occur. This is not in accordance with observation, however, as will be shown in discussing death from that cause.

Mode and Incidence of Invasion.—*Rigor mortis* appears *first* in the involuntary muscular fibre, and that occasionally gives rise to the view that there is hypertrophy of the heart, when it is only rigidity or contraction of its walls produced from this cause. Whether to this cause solely may be attributed post-mortem delivery—from contraction of the uterine muscular fibre—is yet an open question; we are of opinion, however, that it is an important factor. It next appears in the voluntary muscles, and usually, in the following order, viz.: the muscles of back of neck and face; muscles of thorax, back and front, front of neck, and of upper extremities; muscles of trunk of body; and last of all, the muscles of the lower extremities. Larcher[1] from the examination of this phenomenon in 600 bodies, came to the conclusion that the order was as follows: (1) muscles of lower jaw; (2) of lower limbs; (3) of neck; (4) of upper limbs. He further states that joints of lower jaw and knee stiffen more thoroughly, but more slowly, than the shoulder-joints; and that the muscles which stiffen first are the longest to remain in that condition. From observations made in the mortuary of the Glasgow Royal Infirmary many years ago, we cannot sustain the findings of this writer; our observations lead us to the order first described, and to distinctly affirm that

[1] *Archives de Médecine*, 1862.

the muscles in which *rigor mortis* first appears are those in which it first disappears.

Period of Invasion.—This can only be stated in a very general way, since so many factors determine the result. On the average, however, stiffening will likely have begun in the neck and jaw and face about 5 to 6 hours after death, will be definitely present in the upper part of the body in 10 hours, and will be present over all the body between 12 to 18 hours; and it will, in all likelihood, have passed off in the bulk of cases by the end of 36 hours. Under certain circumstances, however, it may appear unusually early, or its appearance may be retarded unusually long. Brown-Séquard states, for example, that in a death after an exhausting attack of enteric fever, it was present 3½ minutes after death, disappeared in about 15 minutes, and that putrefaction had begun within 1 hour, after death. Another case is recorded by Finlayson, in which *rigor mortis* was generally present in the body 15 minutes after death.[1] On the other hand, in certain cases, it has not appeared until the lapse of 16 hours after death, and has been present as long as 21 days thereafter.

Modifying Factors of Onset and Duration.—There are four principal factors which determine the time of onset and its duration, viz.: (1), Age; (2), Muscular State of the Body; (3), Temperature of Environment; (4), Mode of Death.

(1) *Age.*—It has been asserted that *rigor mortis* does not appear in the immature fœtus. We have, however, without doubt observed it in the fœtus of seven months, although it was but transitory. The term "maturity" applied to the fœtus is, after all, but a relative term, and every fœtus of seven months is not in the same condition with respect to the state of development of its muscles; therefore, it would be better, in applying the above rule, to speak of the immature muscular development of the fœtus, since, in our opinion, the rule would then hold good. It appears definitely in the mature fœtus, in the newly-born child, in young infants, and in every age-period up to old age. It is usually well marked in adolescents, in adults of young and of middle age, but is less well marked in elderly persons. These conditions are to be accounted for, especially, by the second factor, viz.:—

(2) *Muscular State of the Body.*—Other things being equal, the stronger muscularly the person is at the time of death, the slower is the time of onset and the longer its duration. The converse is equally true: the more feeble or exhausted the muscular condition, the more rapid the time of onset and the shorter the duration. This general rule may be laid down, viz.: *That whatever exhausts the muscular irritability before death causes the early appearance and the more rapid disappearance of rigor mortis.*

(3) *Temperature of Environment.*—In colder and more temperate climates the time of onset conforms to the above rule. If a body, already the subject of newly established rigidity, be exposed to a temperature of 75° C., the rigidity becomes more pronounced, since other albuminates in the muscles, in addition to myosin, become coagulated. This phenomenon has sometimes been called Heat Stiffening. If, on the other hand, a body be exposed immediately

[1] *B. M. J.*, vol. ii. September 6, 1884.

after death by violence or otherwise, to a temperature at or below freezing point, the onset of the stiffening is retarded so long as this temperature continues; but when the temperature is gradually elevated to 10° C., or 50° F.,—in short, when it is thawed—it comes on rapidly, but disappears more quickly than it would have done had it not been subjected to the process. This happens, for example, in the frozen carcases of animals transported in this condition from abroad.

(4) *Mode of Death.*—This as a modifying factor when reduced to its elementary conditions, is but another way of speaking of the exhaustion of muscular irritability. Whatever exhausts the muscular irritability hastens the onset and shortens the duration of the stiffening; hence, in all exhausting diseases, of long or short duration, *rigor mortis* appears early and passes off quickly: this would include, therefore, all long-continued, febrile, and chronic diseases, in addition to continuous convulsive disorders, however produced, and, by extension of the principle, to over-driven animals or over-worked persons. Chronic alcoholism favours the long duration of the stiffening and retards the onset of putrefaction, doubtless by inhibiting the combustion of the tissues during life.

Table Showing Conditions which Affect Rigor Mortis.

I.	Where Muscular Irritability is reduced . Where *Rigor Mortis* Appears and Disappears Early . . Where Putrefaction Commences Early .	(1) Body weak and emaciated; (*a*), from want; (*b*), from disease; (2) Feeble muscular development; (3) Exhaustion of muscular irritability; (*a*), from violent exertion prior to death; (*b*), from convulsions; (*c*), tetanus, or strychnia poisoning; (*d*), violent muscular contortions from lightning-stroke; (4) From protracted or febrile diseases; (5) Where temperature of environment is high.
II.	Conditions opposite to above . . .	Conditions converse of above.

The three conditions which simulate *Rigor Mortis* are:—

A. The stiffening of Catalepsy.

B. Freezing of the Body, from exposure in Winter.

C. Heat stiffening.

The first having, however, been eliminated in the examination of the body for real or apparent death, by the maintenance of a bodily temperature compatible with life over a period incompatible with the existence of actual death, we need describe it no further, except to say that if a limb extended and rigid from this cause be flexed, it will return to its former state. With respect to the second condition,

it may be distinguished by the fact that flexion of the joints is always accompanied by crackling sounds due to the fracture of the frozen fluids of joint and surrounding tissues. The condition of heat stiffening may be seen in bodies of persons who have precipitated themselves, or who have fallen, into vats of boiling fluids. It may also be observed, but usually in a more limited way, in persons who have been burnt to death in paraffin-lamp accidents, in which roasting and charring of parts of the body have occurred.

There is another condition which is of considerable medico-legal importance, and which is known by the names of *Cadaveric spasm*, or *Instantaneous Rigor*. It may be found, for example, in the hand of the suicide which grasps a weapon which he has used against himself. We have seen it several times in cases of cut-throat, and, then, the weapon was so firmly clutched that it required considerable force to disengage it. This condition is, without question, due initially to a voluntary vital act; and it would appear as if the last voluntary act of life were continued right into the period of general *rigor mortis*. It does not appear that an adequate explanation of the phenomenon has yet been made. That it is not simply an unusually early local onset of ordinary cadaveric rigidity seems quite clear, because the local muscles do not share in the general primary flaccidity of the muscular system, else the weapon would fall out of the hand, or the postural attitude of the body would be lost. Whether the nervous system plays an important part in it,—and that is likely,—and if so, to what extent, are questions which future experiment and research have yet to reveal. One instance of it which has become historical occurred in the famous charge of Balaclava during the Crimean War. Captain Nolan, while riding in front of his cavalry, was wounded by a Russian shell, which tore open his chest-wall. "The arm which he was waving in the air at the moment remained high uplifted, and he retained his seat on his horse, which wheeled round and returned; the rider gave a death-shriek, and passed through the ranks in the same position and attitude before dropping from the saddle."[1] Several like instances have also been observed in other campaigns. When a weapon, or other article, is found firmly clutched in a dead hand, it is a positive proof that it was in the hand of the person during life, and that the grasp was about the last, if not the very last, voluntary act of his life; further, it is almost conclusive proof of suicide, for nothing can simulate it, and it cannot be produced in any way after death, as we have tried several times experimentally without success. Indeed, instantaneous rigor is to be found only in cases in which, before death, there has been high mental tension and nerve excitation.

If the phenomena of death, already described, be found on a dead body, it may fairly accurately be affirmed that death had occurred from two to three days before, at the outside limit.

The different muscular states which a body undergoes between the period of somatic and molecular death may be summed up as follows:—

I. The condition of Primary Flaccidity; condition of relaxed muscles—responsive to electrical stimuli;

[1] Ogston, *op. cit.* p. 375.

II. The condition of Cadaveric Rigidity, or *Rigor Mortis*—condition of muscular stiffening of body;

III. The condition of Secondary Flaccidity, irresponsive to any kind of stimulus, which is synchronous with the onset of Putrefaction.

During the first, and so long as some measure of molecular life in the tissues remains, electrical stimuli will produce response in muscular contractility; and the chemical reaction of the muscles will either be neutral, or faintly alkaline. During the second, molecular death takes place; therefore, no stimulus will provoke response; reaction is then markedly acid. During the third, disintegration of muscular elements takes place; reaction becomes again alkaline.

The last stage in the resolution of the body from the organic to the inorganic state is that commonly called Putrefaction.

The agencies by which the body is reduced to the latter state are animalculæ and micro-organisms of a great variety of kinds, aided by the action of warmth and the presence of moisture. There is a fauna and flora of decomposition[1] which forms an interesting subject of study, but which cannot be discussed in detail now.

The various steps of the process of putrefaction need not be particularly described, but its outstanding features cannot be omitted. Within 36 to 48 hours after death, in usual circumstances, the superficial veins of the body begin to assume a brownish colour, and thus give the body a marbled appearance; the dependent parts being all the time of a more or less livid colour. In about 3 to 5 days, a greenish or bluish coloration of the skin which then appears, or has a short time before appeared, on the body—in the abdomen (right iliac region) of bodies exposed in the air, or over the sternum in those exposed in water—begins to spread slowly over the body. Thereafter, it depends upon meteorological conditions how rapidly the putrefactive process is hastened. By the evolution of gases of putrefaction in the various cavities of the body, and through the liquefaction of the tissues produced by the same micro-organisms, the cavities eventually burst open from the tension of the gases, and the stage of colliquative putrefaction is reached. So far, this description applies generally to the process as it occurs in the air, or in the earth. But in a body which has lain in the water, the process is somewhat different. In this case, the first appearance is bleaching of the palmar and plantar skin surfaces; next, there is a bloated and swollen state of the tissues of face and body, accompanied or followed by a greenish discoloration of the anterior aspect of thorax; this, in turn, is succeeded by an extension of these conditions and a distended state of the abdomen due to putrefactive gases, although the colour of the skin of abdomen remains free from the greenish colour for a long time thereafter. Different views are entertained as to the nature of the bluish or greenish colour produced on chest or abdomen. The initiating cause is, without question, microbic; but whether the colour is a pigment the result of chromogenetic organisms, or to the formation of a compound of Iron, Potash, and Cyanogen, is not definitely determined.

[1] *Vide* a paper by Hough on "The Fauna of Dead Bodies," *B. M. J.*, vol. ii., 1897, p. 1853.

Probably it is due to both. The putrefactive process, thereafter, depends upon (*a*), conditions of weather, and (*b*), the character of the column of water in which the body is immersed with respect to purity or impurity; decomposition being retarded by low temperatures, and pure fresh water, or sea water, and hastened by high temperatures, and water of stagnant pools and cesspools, liquid sewage, or columns of water polluted by sewage.

The following Table shows in summarised form the approximate times within which certain changes of the appearances of the body take place, but they must be considered as only approximately correct, and the consideration of the length of time which has elapsed since death, must have strict reference to the conditions of each separate case.

Table to illustrate Progress of Putrefaction.

One to Three Days . .	Greenish coloration of right iliac region of abdomen: Softening of the Eye-ball.
Three to Five Days . .	Brownish coloration of surface veins of body. Extension of greenish coloration over abdomen, and over other parts of body; swelling of external genitals, and development of brownish or greenish coloration of scrotum, or vulva.
Eight to Ten Days . .	Distension of abdomen with gases, such as H_2S, PH_3(?), and Carbon gases; Liquefaction of eye-ball.
Fourteen to Twenty-four Days .	Formation of bullæ, of varying large size, on skin. Increased distension of abdomen. Bloated condition of whole skin of body. Increase of discoloration over body. Maggots appear in orbits, on scrotum, or upon other parts of body. Nails are loose, and are falling off. Swollen, bloated, condition of face, rendering recognition impossible.

After this, it is impossible to time-table the progress of decomposition. The preliminary to disarticulation of the body is the onset of the colliquative stage, which occurs at too variable a period to be named, but in which the cavities of the body, and the joints, are burst open, and the internal organs rapidly undergo dissolution, at a rate depending upon the state of organisation.

Such is the average development of putrefaction in a body in air. In water, it would appear as if the putrefactive changes proceeded more rapidly in the chest; with but this exception, the former description may, generally, be held as equally applicable to the latter.

Putrefaction, however, may be modified in its progress, and in the character of the products formed.

The two principal modifications are:—

A. Saponification.
B. Mummification, or Desiccation.

A. Saponification.—A body upon which moisture has been constantly acting—whether it be immersed in water or in damp soil—

may undergo this change. It may, indeed, happen in a limited way in a body shut up in a bag or trunk, from the amount of fluid naturally present in the body. In the body previously described (p. 84), certain parts were distinctly adipocerous, particularly over the buttocks and thighs.

Saponification consists in the metamorphosis of the nitrogenous and fatty constituents of the body into new chemical compounds which are more or less stable in composition. Collectively, these compounds are known as adipocere (*adeps* = lard, and *cera* = wax), from the unctuous, yellowish-white, waxy appearance which the substance shows on section. Adipocere is a fatty-looking substance which may vary in colour from a white to a yellowish-white tint, imparts an unctuous feeling to the fingers, melts at a flame, and burns with a

FIG. 31.—Photograph of a piece of Adipocere in possession of the Author. It represents the outer fleshy part of the upper thigh. It is coloured by rust on its exterior, and the planes of fibrous tissue are still plainly observed in the adipocerous mass.

feebly luminant flame, and has a faint mouldy, cheesy odour. On its external surface it may be reddish-brown from coloration due to rust from the coffin-nails. (Fig. 31.)

In fact described by Sir Thomas Browne

Chemical Composition.—Adipocere is essentially a compound hard soap, the alkali of which may be Ammonia, Soda, Potash, or Calcium—usually a combination of these—in differing proportions. The Ammonia is obtained from the decomposition of the nitrogenous compounds of the body by microbic action, from the union of the liberated nitrogen and hydrogen, which unites with the fatty acids of the fatty structures of the body—oleic, palmitic, stearic, butyric, and others—to form a substance which is composed of the oleate, palmitate, and stearate of these alkalies, the whole being united together by the fibrous tissues of the part involved, as these are not affected by the process, and being coloured, as described, on the surface by oxide of iron. In addition, there is an odorous, volatile substance which is difficult

to name, but which, in our opinion, is composed of volatile fatty acids. Such is a description of specimens in our possession. Adipocere has a melting-point of 126.5° F., and it is more or less soluble in hot alcohol.

It is not usual for the whole body, in any given case, to be converted into adipocere, but Dr. Guy[1] has seen whole bodies transformed completely among the bodies disinterred while laying the foundations of King's College Hospital. In connection with like operations at the Royal Infirmary, Glasgow, in 1879–1880, we examined some of the pits which were then laid bare, into which were put the bodies of some of those who had died in the typhus and cholera epidemics of

FIG. 32.—Mummified Fœtus found behind a kitchen grate. Between the lower limbs may be seen the ligature—a piece of white tape—by which the umbilical cord had been tied. It does not appear to have been of viable age. (Author.)

1848–1849, and we observed whole limbs, chiefly the lower, the chest and shoulders, and, in several cases, the buttocks, so changed, but in no case the whole body. This change into saponification takes a considerable time to produce. Even in limited areas of the body it will take some months; usually, however, it takes years—probably not less than ten. It appears more quickly in the bodies of infants and young children than in those of adults. Casper[2] narrates an instance in which the body of a newly-born child buried in damp soil, was found converted into adipocere to the extent of one-third, by the end of thirteen months. It is very difficult, indeed, to lay down any rule regarding the time in which in any given case it may be produced, owing to the variable factors of moisture and air.

B. MUMMIFICATION.—The derivation of the word descriptive of this change points to its character, viz., that of desiccation. It is a common result after a complete process of embalming, but it happens naturally only in few circumstances. According to Damaria, it is a

[1] *Op. cit.* p. 257.

[2] *Op. cit.* vol. i. p. 41.

common occurrence in bodies inhumed in certain parts of Piedmont, and it is found, not infrequently, in bodies buried in shallow graves of sandy soil in hot climates, or in warm dry vaults as at Malta and elsewhere. It has occasionally been noted in the bodies of infants which have been secreted behind kitchen-grates, or in dry-stone walls, or in trunks kept in a warm atmosphere. The late Professor Ogston[1] mentions two cases illustrative of the latter, and we have seen one instance of the former. The factors necessary for its production are: (1) the absence of dampness, and (2) the continuous action of a current of dry, or warmed, air. The appearance of a mummified body is remarkable in this, that while the whole structure is desiccated, black, and shrivelled, the anatomical features, even to minutiæ, are preserved. The skin, which clings closely to the shrunken framework of the body, and the hair on the scalp, are preserved intact; and even the skeletonised features of the face are also preserved. In a fœtus in our possession, found behind a kitchen-grate, not only is the stump of the umbilical cord still present, but also the ligature with which it was tied; and the individual bones of the carpus and metacarpus may even be counted. (Fig. 32.) This specimen has remained unaltered, under a glass case, for at least twelve years. The body in this condition is practically odourless, and any faint odour perceptible is only that of fustiness. Mummification is said to come on more readily in cases of poisoning by Arsenic owing to the preservative action of this substance, but of this we have had no experience.

Putrefaction of Internal Organs.—While a body is undergoing putrefaction, the internal organs do not disappear synchronously, as might be expected from the different organised conditions in which these exist. Obviously, the more highly organised the structure of the organ, the more resistant is it to the putrefactive process; and the converse is true.

The following tabulated statement of the order of putrefaction of these organs must, therefore, be interpreted in that view.

The organs may be divided into two classes, viz.:—

1. Those which putrefy early.
2. Those which putrefy late.

Of the former class are the following:—

1. Trachea.
2. Brain (of young).
3. Stomach and Intestines.
4. Spleen.
5. Liver.
6. Adult Brain.

Of the latter:—

1. The Heart.
2. Lungs.
3. Kidneys.
4. Urinary Bladder.
5. Gullet.
6. Diaphragm.
7. Aorta.
8. Uterus.

1 *Op. cit.* p. 69.

It will be seen from the foregoing that the organs which are composed of muscular layers resist putrefaction longer than the parenchymatous organs, with the exception of the stomach and intestines, which, by reason of their putrefactive contents at the time of death, decompose quickly. Again, it may be said that the rapidity of the process depends, in some measure, upon the amount of fibrous tissue which an organ contains, as in the lungs. Further, the internal organs of the young putrefy more rapidly than those of the middle-aged or the elderly.

Factors which Modify Rate of Putrefaction.—These may be divided into—

I. Internal Factors.
II. External Factors.

I. Internal, or Subjective.—The following are the chief: (1) Age; (2) Sex; (3) Condition of Body at Death; (4) Kind of Death.

1. *Age.*—Bodies of newly-born children, and of the young generally, putrefy more rapidly than those of later life. Very old bodies do not putrefy rapidly because already they are partly shrivelled.

2. *Sex.*—This has but little influence, except in the case of the bodies of women dying after child-birth, more especially when death has been caused by septicæmia.

3. *Condition of the Body.*—The physical state of a corpse influences the rapidity of putrefaction to some extent. Fat, flabby, lymphatic corpses putrefy more quickly than lean, shrivelled bodies, doubtless due to the larger amount of fluid in the tissues of the former.

4. *Kind of Death.*—The bodies of persons dying suddenly in robust health decompose less quickly than those of persons dying of acute or chronic diseases, especially of the infective diseases. Much mutilation of tissue, too, favours decomposition from the larger area exposed to the action of animalculæ, as also suffocation by smoke, H_2S, etc.; while the bodies of chronic alcoholics, and those who die by poisoning from Carbolic Acid, Arsenic, Antimony, and Chloride of Zinc, etc., resist putrefaction longer, owing to the preservative action of these substances on the tissues, or to their destructive or inhibitive action on the ordinary fauna which induce decomposition.

II. External or Objective.—Of the external factors, the following are the chief:—

1. The Presence or Absence of Air;
2. The Temperature of the Medium;
3. The Presence or Absence of Moisture;
4. The Kind of Medium in which the body lies.

1. *The Presence or Absence of Air.*—The presence of air promotes, its absence retards decomposition. So, likewise, any factors which contribute to the free play, or the opposite, of the atmosphere, will accelerate or retard. Things being equal, a nude body will decompose more rapidly than one ordinarily clothed. Porous sandy soils, for the same reason, accelerate decomposition, while clayey, dense, or water-logged soils will retard it; hence the advisability of forming places of interment in open, sandy, or gravelly, soils. Likewise the kind of coffin used for encasing the body helps or hinders; a wicker-work

coffin, or one composed of roughly adjusted deal planks will help, while hardwood, zinc, or lead "shells" prevent or retard. In the interment of bodies, since rapid dissolution of the body is aimed at, only the former conditions should be adopted; too strong words cannot be used in condemnation of the practice of interring bodies in air-tight coffins.

2. *The Temperature of the Environment or Medium.*—Putrefaction begins at about 50° F., is most favoured by temperatures from 70° to 100° F., and is retarded between 100° and 212° F., because the fluids are dried up. Moreover, microbic action is hindered at too high and too low temperatures, while at low temperatures, the fauna of decomposition are paralysed in action. It is for these reasons that in arctic climates, such as Northern Siberia, huge carcases of animals now extinct have been discovered intact, even with the hair *in situ*, just as if they had been buried some days before, and the bodies of men, in crevasses, after Alpine accidents, have been found fresh long after the occurrence of their death. Upon the action of cold, too, is based the importation of fresh meat and fruits from foreign countries.

3. *The Presence or Absence of Moisture.*—Moisture is absolutely needful for ordinary decomposition of an animal substance, and usually the body contains sufficient for the process. Any additional moisture, however, aids in the rapidity of the action; hence the reason, or one of them, why bodies decompose more quickly in water than in the earth. And if warmth be added, the rate of decomposition is much hastened.

4. *The Kind of Medium in which the Body lies.*—These media are three in number, viz.: Air, Earth, and Water. We may take the dictum of Casper[1] on this point as being approximately correct. "At a tolerably similar average temperature, the degree of putrefaction present in a body after lying in the open air for a week or a month corresponds to that found in a body after lying in the water for two weeks or months, or after lying in the earth in the usual manner for eight weeks or months;" in other words, a body, *cæteris paribus*, decomposes in the air twice as quickly in the same time as in water, and eight times as rapidly as in the earth.

Putrefaction rapidly develops in bodies which are exposed in water largely charged with sewage, and especially so, if in summer. After the deplorable accident at the launching of the steamer *Daphne* in the Clyde in July 1883, in which many workmen working on board at the time of the launch were drowned, we had an opportunity of examining the bodies of the victims as they were recovered. Several of the bodies floated within eight days so decomposed that identification was not possible except by their attire. The whole body was uniformly bloated and of a reddish-livid colour, the natural cavities were abnormally inflated with putrefactive gases, especially the abdomen, and for the latter reason, many of the bodies came to the surface floating buttocks upwards.

Exhumations.—It is sometimes necessary for the purposes of the criminal law, in cases of life insurance where the cause of death is disputed, in charges of desecration of graveyards, and in other contin-

[1] *Op. cit.* vol. i. p. 37.

gencies, to disinter bodies for examination; in the two first-named cases, to determine the actual cause of death, and in the last, as to disturbance of graves. Or exhumation may be called for where relatives desire a body to be disinterred from a graveyard in one place and interred in a graveyard in another. In any case, it is a very disgusting operation, and one which is not unattended by danger. The order of procedure is this: The Crown Authorities, that is, the Sheriff in Scotland, or the Home Secretary in England, grants a warrant to the medical inspectors to disinter, and in needful cases, to dissect the body. The necessary preparations having been made with the authorities of the graveyard, the body is disinterred, and the examination of the body made. The body should be identified by the relatives, when possible; failing such, the undertaker and gravedigger should, at least, identify the coffin and the grave. It will be well to take the following precautions, viz.:—

1. Let the exhumation be conducted in the coolest and lightest time of the day;
2. Let the dissection be performed, when possible, in the open air, and in a place temporarily screened off from public gaze; or if under cover, in as airy a place as possible;
3. Provide plenty of disinfectants,—Chloride of Lime preferably, —water, sponges, and cloths;
4. After the body has been exhumed and liberated from the coffin, expose it to the air to permit the concentrated foul gases to be dissipated; thereafter, souse the body with a strong solution of Chloride of Lime in water;
5. During the examination, keep as much as possible to the windward side of the body, and use plentifully disinfectants for the hands during the inspection.

The examination should be conducted in like manner to that of a comparatively fresh body, both as to method and completeness; and the same precautions should be taken where poisoning has been suspected, in securing, when possible, the stomach and its contents and the other internal organs, and in establishing identity of the specimens in their passage from hand to hand for chemical analysis. In such cases, too, it is important to preserve a portion of the earth surrounding the coffin and portions of the coffin itself, lest it might be set up as a defence, in the event of a poison such as arsenic, for example, being found, that what was found in the body was imparted to it by the soil.

The law in some countries imposes limits as to the time within which an exhumation may be permitted. In Scotland, the limit is twenty years; but in England, there is no limit of time. In France, the period is ten years, and in Germany, it varies with the enormity of the crime committed, viz.: for offences punishable by death, 30 years, for offences punishable by imprisonment for ten years or more, 20 years; the period becoming shorter, *pari passu*, with the crime.

CHAPTER VI.

LAW AS TO DEATH CERTIFICATION.

THE general discussion of the subject of Death would be incomplete without some reference to the legal duties and relationship of the practitioner to the State with regard to the certification of deaths, since his duty does not cease in a case at the termination of life.

Certification of death is one of those duties which the Legislature has imposed upon the medical profession and which must be performed without fee or reward. Failure to testify is followed by a penalty. It is necessary, therefore, that practitioners should know their duty to themselves, to the State, and to the dead, in its civil and criminal relationships.

Law on the Subject.

I. In England. The Acts of Parliament in which the law is written are the Registration Act, 1836 (6 & 7 Will. IV. cap. 86), and the amending Act, the Births and Deaths Registration Act, 1874 (37 & 38 Vict. cap. 88). Under section 20, sub-section 2, of the latter Act, where a person has been attended during his last illness by a registered medical practitioner, such practitioner is bound to give a certificate, in which he states to the best of his knowledge and belief the cause of death, and said certificate the practitioner is to give to the person required under the Registration Act—the "qualified informant"—to convey it to the Registrar of the district. The following are the exact words of the foregoing 20th section of the statute: "In the case of the death of any person attended during his last illness by a registered medical practitioner, that practitioner shall sign and give to some person required by the Act to give information concerning the death a certificate, stating, to the best of his knowledge and belief, the cause of death." On the question being raised by a medical practitioner as to whether he or any other practitioner could refuse to give a certificate, it was submitted to the Registrar-General for his views on the subject, to which he replied as follows: "The duty of the medical practitioner is very clearly explained by the 20th section of the Act, which admits of no other interpretation. . . . The medical practitioner under the circumstances described in the Act has no option in the matter; he cannot withhold the certificate. He can, of course, if he sees fit, himself communicate with the coroner or police with regard to any suspicious circumstances which may have come under his notice when in attendance during the last illness of the deceased; but he may safely leave this duty to the registrar, who in his 'Regulations' is directed to report to the coroner [on a form provided from this office] all deaths caused directly or indirectly by violence, or which have been attended by suspicious

circumstances, as well as sudden deaths, and every death the cause of which is stated to be unknown."[1] Such an interpretation of the statute makes it compulsory, therefore, for a medical man to report upon the cause of death, no matter how disagreeable may be the immediate or remote consequences of this statutory duty to the friends or relatives of the deceased, whenever the cause is known and whatever the cause may be; but there are, at the same time, cases in which by reason of suspicious circumstances, the practitioner may not be able to decide between the symptoms of natural disease and poisoning. While he has no desire, through a mistake, to give unnecessary publicity to the case, which, after all, if he were proved wrong, would reflect harmfully upon himself, he may be equally actuated by the desire to prevent a miscarriage of justice. In such circumstances, it would be most advisable before granting the certificate to have a personal interview with the coroner, with whom the best course to be followed under the circumstances may be arranged. Failure to certify makes the practitioner liable to a penalty of 40s., and the giving of a false certificate makes him liable, on summary conviction, to a fine of £10, or on indictment, to seven years' imprisonment. A medical man, however, in the above circumstances may refuse, on reasonable grounds, to grant a certificate.

In cases of death which have been the subject of inquest by the Coroner on information given by a medical man or by others, it becomes the duty of that official by the Act (50 & 51 Vict. c. 71, secs. 18 (3), 4 (4), and 16) to send to the Registrar a certificate of the finding of the jury as to the cause of death within the time required by the Registration Acts. It is important, also, to consider what is the time which is applicable to the "qualified informant" in the ordinary case. Sections 10 and 11 of the Births and Deaths Registration Act, 1874, enact that personal information of a death must be given to the registrar by the informant, with penalty of 40s. in case of failure, within *five* days of its occurrence, or, where a written notice of the death with an accompanying medical certificate of the cause of death is sent, within *fourteen* days.

II. In Ireland. The law is included in the following Acts, viz.: the Registration of Births and Deaths (Ireland) Act, 1863 (26 Vict. c. 11), and the amending Act, the Births and Deaths Registration Act (Ireland), 1880 (43 & 44 Vict. c. 13). As in England, the practitioner in attendance during the last illness of a deceased person is bound to give to the informant of the death a certificate, in which the cause and other particulars are duly stated, which certificate must be delivered by the informant to the registrar within five days after the death. The same penalties apply as in England in cases of failure to certify and of false certification; and like provisions control the action of the Coroner by virtue of 43 & 44 Vict. c. 13, sections 17 and 20.

III. In Scotland. The Registration Acts (which must be read together) at present in operation are: (1) The original Registration Act of 1854 (17 & 18 Vict. c. 80); (2) the first amending Act, 1855 (18 Vict. c. 29); and (3) the second amending Act of 1860 (23 & 24 Vict. c. 85). Section 41 of the original Act and section 14 of the second

[1] *The Lancet*, vol. i. 1887, p. 1144.

amending Act both deal with the relation of the medical practitioner to the registrar with respect to the certification of deaths, and are to the effect that the practitioner who attended during the last illness of a deceased person is bound to transmit to the registrar, within seven days after the death, a certificate of the cause of death; failing to do so, the registrar must then forward to him a certificate-form duly filled in, and by a printed or written requisition, shall require him to return the said form duly completed within three days after receipt thereof, under a penalty not exceeding forty shillings in case of failure. In cases which have been inquired into by the Procurator-Fiscal, this official, by section 40 of the original Registration Act, is bound to inform the registrar of the result of said inquiry, but no time is defined in the Act within which said information must be returned to the registrar (*vide* p. 10). Contrasted with England and Ireland, the relation of the practitioner to the duty of certification of deaths is legally different. In the former, he is bound to deliver the death certificate to the legal or qualified informant who is bound, under a penalty, to convey it to the registrar; in *Scotland, on the other hand, the practitioner is himself bound to send to the registrar such certificate within seven days after death, or within three days thereafter after notice by the registrar, where he has failed to do so.* Such then is his legal duty. In practice, however, it commonly happens that the informant obtains the necessary certificate from the practitioner soon after the decease, and himself conveys it to the registrar.

While the foregoing, therefore, is an exposition of the law relating to the duty of the medical profession in the certification of deaths in the different parts of the kingdom, there are certain points which, by being attended to on the part of the practitioner, will contribute to his safety against fraudulent practices. While he is bound to state on the death-certificate (in its unaltered form) the date upon which he last saw the person alive of whose death he now certifies, it may happen that that date is not very proximate to the date of death; again, he may be asked to certify the death of a person whom he has but once seen: in both of those circumstances, it is best for the practitioner himself to verify the fact of the occurrence of death before he grants certificate, else he may find that he has certified the death of one who is yet alive. A few years ago, an old and respected practitioner of Glasgow was tried before the Justiciary Court on the charge of false certification, the facts being that he had granted a certificate of death of a man, whom he had seen but once, on a representation by friends that death had occurred, but which was untrue, as the person was then alive. He was acquitted of the charge of wilful false certification. In the evidence given before the Select Committee of the House of Commons on Death Certification, Dr. Grimshaw, Registrar-General for Ireland, told the Committee the following facts: Dr. Lyons—who was at one time a member of Parliament—when in practice in Dublin, was attending a man who was very ill from paroxysmal asthma, complicating bronchitis. He saw the man one day in a very bad attack. Next morning, friends of the patient called at the house of Dr. Lyons, stated that the patient was dead, and asked that a certificate of the cause of death be sent to them. It happened, however, that Dr.

Lyons had gone out on his round of visits, and calling upon this patient early because of his serious condition, found the man not only alive, but sitting up in bed. It was clear that the informants wanted the certificate from Dr. Lyons so that they could register the death and obtain the insurance money. It is very important, too, that a practitioner should not grant a certificate of death of a person whom he has not seen for a length of time, even although the person is known to him as suffering from a disease which might easily and suddenly prove fatal, such as, for example, heart disease. A coroner stated before the above Committee that, on one occasion, he had to make inquiry concerning the cause of death of a man. A medical man was prepared to certify that he died from heart disease, he having seen the person and having diagnosed that disease six months before, although he had not seen him in the interval. The coroner, however, because of the extreme desire of a brother of the deceased that an inquest should not be held, thought the circumstances suspicious, and, on holding an inquest, it was proved that the deceased died from a suicidally-inflicted pistol-shot through the heart. Although the law, as yet, makes no recompense to the practitioner for the certificate which he is bound to give, and will make none for the trouble he may take in personally verifying the fact of death in any case, it exacts of him at the same time the exercise of reasonable care in the performance of such a duty, and, therefore, for his own comfort, he will do well under such circumstances as the above to personally view the body before granting a certificate, or to decline entirely to grant a certificate.

But there is another aspect of the question which it is important every practitioner should know, and that is with relation to the number of certificates of death he is legally entitled to give of any individual death. Although there is no statutory enactment which expressly forbids a medical practitioner to give a number of certificates, there are statutory provisions which will disannul the value of, if not, entirely disallow, all certificates more than one. Such legal provisions arose out of an attempt to prevent the over-insurance of children—a practice which was attended with a fearful sacrifice of young life in some of the chief cities of this country, and with wholesale murder in Liverpool and elsewhere by poisoning.

Medical Certificates of Death as affected by the Friendly Societies Act, 1875 (38 & 39 Vict. c. 60).—In Section xxviii. of this Act, it is enacted:—

1. That no society shall insure or pay on the death of a child under five years of age any sum of money which, added to any amount payable on the death of such child by any other society, exceeds six pounds, or on the death of a child under ten years of age any sum of money which, added to any amount payable on the death of such child by any other society, exceeds ten pounds.
2. No society shall pay any sum on the death of a child under ten years except to the parent or personal representative of said parent and upon production by said parent or representative *of a certificate of death issued by the registrar of deaths.*
3. No registrar of deaths shall give any one or more certificates

of death for the payment in the whole of any sum of money exceeding six pounds on the death of a child under five years, or exceeding ten pounds on the death of a child under ten; *and no such certificate shall be granted unless the cause of death has been previously entered in the register of deaths on the certificate of a coroner or of a registered medical practitioner who attended such deceased child during its last illness*, or *except upon the production of a certificate of the probable cause of death under the hand of a registered medical practitioner, or of other satisfactory evidence of the same.*

4. That it shall be an offence against this Act if any society pays money on the death of a child otherwise than is provided for in the Act, if any parent or his representative claims money on such a death by any certificate of death other than is provided for in the Act, or by false or fraudulent certificate, or in any way attempts to defeat the provisions of this Act.

From the foregoing, therefore, it is perfectly clear that the intention of the Legislature regarding the insurance of the lives of children at least, is that the medical practitioner shall only provide one certificate of the death to the qualified informant, who, in conveying said certificate to the registrar and on statement of the fact that the deceased was insured, shall be entitled to the provisions of the Act in respect of the sums to be paid for the ages definitely stated; and further, that the duty of giving the number of extract certificates of death to cover the sum to which the informant is entitled shall be imposed solely on the registrar. It is, therefore, better for the practitioner to satisfy the requirements of the Registration Acts, and to leave the relatives and registrar to settle the rest.

Again, under no circumstances should a medical man be tempted to sign blank certificates, or to sign the certificate of death of a person while such person is still alive. This may not only bring upon him a charge of false certification,[1] but his action may be deemed "infamous conduct in a professional respect" by the General Medical Council, and may effect the removal of his name from the Medical Register.

Under what circumstances may a Medical Practitioner decline to grant a Certificate of Death?

It is to be noted that it is expected that a medical man who has attended during a fatal illness will be able to state the cause of death, and that, in certain circumstances even without such attendance, he may equally be able to certify the probable cause of others. For the purposes of the State, certification of death by the medical profession is intended to effect two objects, viz.: first, to designate the cause of death for statistical purposes, and, second, to prevent criminal practices. While the law desires that the cause of death should be accurately certified so far as that is possible, it certainly expects that the practitioner shall be able to say whether it was due to natural or to unnatural causes. If he be satisfied that it is due to the former class, the knowledge of this fact would entitle him, nay compel him, to certify, and the statement of the fact ends the matter. On the other

[1] *B. M. J.*, vol. i. 1900, p. 1365.

hand, if he has grave suspicion, and more so, if he sees actual proof, that the death is due to an unnatural cause, then his clear duty, in the former case, is to decline to grant a certificate, and, in the latter, to state the facts, leaving it to the legal authorities to deal with the questions of cause and culpability. In the Maybrick case, for example, because of no certificate being granted, an inquest had to be held. Therefore reasonable suspicion of foul play would be a justifiable cause for withholding a certificate. In the same category may be reckoned lapse of time between the dates of the death and his last visit to the deceased. A medical practitioner is not warranted in withholding a certificate of death by reason of his fees for the attendance not having been paid. In 1898, a medical practitioner was tried on the charge of failing, without reasonable excuse, to sign and give a certificate of death of a person upon whom he had been in attendance up till the time of death. He urged the above as a reasonable excuse, but the magistrate fined him in 40s., and costs.[1]

We are of opinion that if members of the medical profession would decline to grant certificates of death except after personal verification of the fact, and then in strict accordance with the facts, and, further, would decline to do so except in cases in which they had been in attendance, the reforms so much needed in Death Certification would be more rapidly accomplished.

For further information, the reader may consult the Evidence given before, and the Reports of, the Select Committee on Death Certification, of 1893, which was appointed "to inquire into the sufficiency of the existing Law as to the Disposal of the Dead, for securing an accurate Record of the Causes of Deaths in all cases, and especially for detecting them where Death may have been due to Poison, Violence, or Criminal Neglect"; "Death Certification and Registration in Scotland," by the Author, *Glas. Med. Jour.*, Oct. 1893; *B. M. J.*, vol. ii. 1900, p. 1509; *Ibid.* p. 1579; *Ibid.* p. 1647.

[1] *B. M. J.*, vol. i. 1898, p. 862.

CHAPTER VII.

MEDICO-LEGAL FORMS OF DEATH.

HAVING discussed the subject of Death in its general medico-legal aspects, it is now necessary to consider those special kinds of death from causes which usually form the subject of criminal investigation. Among these are included the following, viz. :—

I. By Drowning.
II. By Suffocation.
III. By Hanging, Strangulation, and Throttling
IV. By Lightning and Electricity.
V. By Burning and Scalding.
VI. By Criminal Neglect and Starvation.
VII. By Cold and Exposure.
VIII. By Heat Apoplexy.
IX. By Mortal Wounds.

I. DEATH BY DROWNING.

This is a comparatively common form of death. During each year many cases of death are registered from this cause in England and Wales, and Scotland. Of the total number of suicides by different kinds of violent deaths in England and Wales in 1865–94, 21 per cent., and in Scotland in 1877–94, 28 per cent. was from this cause.

It is important that it should be clearly defined what is meant by death by Drowning. *A person may be said to have died from drowning into whose air-passages and lungs air has been prevented to enter by any watery, viscid, or pultaceous fluid into which his head has fallen and remained.*

It is not necessary for the fulfilment of the act of drowning that the whole body be submerged, nor, indeed, for the whole head; it is enough that the mouth and nostrils be submerged, and that a person so situated is not able to withdraw himself. Intoxicated persons, epileptics, and others, have been known to be drowned in very small pools or shallow puddles of water. We have seen one such death in an intoxicated person who on a December night fell face downwards in a shallow puddle of water about one and a half feet in diameter, and about three inches deep. In the bulk of cases, however, the whole body is submerged. Death by drowning is, therefore, due to asphyxia. Circumstances, such as unconsciousness on the part of the individual from any cause, may modify the appearances found on the body. It has been stated by various writers that in drowning asphyxia is not always the proximate cause of death, and

that instead of the signs of asphyxia being found on all bodies taken from the water there may be evidence of death from syncope or coma. It is difficult to conceive, if we start from the proposition that death by drowning consists essentially in deprivation of air from the lungs by a watery medium, how the signs of asphyxia can ever be absent; since any person who dies in the water, in whom the respiratory function is in operation in any degree, must die from such deprivation of air by the water, and, hence, he must die from drowning, and the post-mortem signs of asphyxia will be revealed on examination. In the entire absence of these signs we are of opinion that it may safely be affirmed that the person did not die from drowning. This does not, of course, exclude the possibility of other signs contributory to death being found; but in every case of death in the water the proximate cause must be asphyxia, since the interference of the water is the cause of impediment and ultimate arrest of respiration. We can conceive but one contingency in which signs of asphyxia will not be found, and that is where the respiratory action has ceased at or before the moment of submergence. A person walking along the bank of a river, or canal, may be seized with a fatal attack of syncope, and his body may fall into the water, but in such a case, respiration being arrested permanently, there will be no water inspired, and, consequently, the signs of asphyxia will be absent. But in cases where persons fall into the water during an ordinary faint, or as the effect of an apoplectic or epileptic seizure, or from serious injuries to the head by falling from a height into the water, the respiratory function will at once be interfered with, and the person will die asphyxiated. In the post-mortem appearances of such cases, difference in degree in the signs of asphyxia will, doubtless, be found, due to the amount of struggle for breath prior to death; and, in addition, there will be other lesions found in the body—hæmorrhage into the brain in apoplexy, and injuries to head, or body, or both, in cases of accident; —but in all of them, the signs of asphyxia will be apparent. These views are based upon the examination of the bodies of about 100 cases of drowning ranging from young children up to persons advanced in life. We believe, therefore, that the following may be taken as a safe rule: *That if a person falls alive into the water—the process of respiration being in operation or resumed in the water—and if he die therein, the proximate cause of death will be asphyxia, of which the signs will be apparent on examination of the body; but the measure of their intensity will be determined by the struggle for breath, and the time occupied in dying.*

Period of Death.—This may be any time between one minute and twenty minutes, since persons have been resuscitated after having been in the water for the latter period. The specific gravity of the human body being slightly less than that of ordinary water when the lungs are ordinarily full of air and when the whole body is submerged, little deprivation of air or raising a part of the body out of the water is all that is needed to cause it to sink. This is usually brought about in the case of those who are not able to swim, or have not the presence of mind to float, by aimless struggling to save themselves. It is only of passing interest to

note that such bodies of water, as the Dead Sea, will easily sustain the human body, by reason of their high specific gravity.

The first medico-legal question which arises in the examination of a body which has been taken out of the water, is—

Was Death due to Drowning?—A presumption—apart from evidence—may be determined in certain cases by the fact that a very large number of deaths is caused by accident during occupation, or while bathing or boating, or of set purpose, as in suicide. On the other hand, it must not be forgotten that bodies are sometimes thrown into the water to cloak the commission of crime in another form. Presumption, therefore, is of no value whatever when dissection of the body will indicate proof. The question, therefore, resolves itself into another, viz.: *Was the person dead or alive before the body was submerged in the water?*

External Appearances.—There are certain external appearances found on a body, which, to a limited extent, help in its solution. These may be summarised as follows:—

1. Coldness of the Body.
2. Pallor of Body Surface.
3. Facial Appearance and Expression.
4. Appearance and Situation of Tongue.
5. Presence or Absence of *Cutis Anserina.*
6. Condition and Appearance of Hands and Feet.
7. Retraction of Penis and Scrotum.

The first two signs are of no absolute value, and may, therefore, be summarily dismissed.

Regarding the Facial Appearance and Expression, our experience is that, in most cases, there is nothing to point to the cause of death. The face of the drowned is usually pale, bears a calm, placid expression, the eyes being either shut or partially open—up till the time when putrefactive swelling takes place. The foregoing will usually be descriptive of the face within 36 to 48 hours after submersion; but after the same period in summer and 8 to 10 days in winter, the face besides being bloated and swollen assumes a reddish or livid tint. The only phenomenon, seen occasionally on the face of the drowned, and which may be taken in the main as characteristic of drowning, is the *presence of a fine froth at the mouth, or nostrils, or both.* Various causes, however, may prevent this being present at the first time of inspection, such as cleansing of the face, or the froth having been washed away by the water on the body being taken out of the water of submersion. It reappears, however, most usually some time after the body has been allowed to lie undisturbed; then, it wells out of both mouth and nostrils, forced out by putrefactive gases, or by the onset of *rigor mortis.* In cases of coal-gas and carbonic monoxide poisoning, froth may likewise appear at mouth and nostrils, but it is composed of much larger bubbles than is that of drowning, which is a fine-bubbled froth. The difference is more appreciable when both have been seen and compared. There is another appearance of the face which, although but comparatively rarely seen, must be carefully noted. We have seen it in, at least, four cases. This is a remarkably rosy hue of the lips and of the skin

over the malar bones, more commonly, however, on the lips than on the cheeks. In every case in which we have seen it the submersion has taken place in winter and during intensely cold, frosty weather. It appears to us to be due to oxygenation of the blood in the mucous membrane of the lips and in the capillaries over the malar bones. In these cases, too, the body either floated within a few hours after submersion, or the act of drowning took place by submersion of the face only in a shallow pool of water.

Appearance and Situation of the Tongue.—It may be said that in the bulk of cases, beyond a slight duskiness of the organ, no unusual colour is present; exceptionally, however, it is darker, and is then accompanied by more marked facial signs of asphyxia. The organ is not infrequently protruded beyond the line of the teeth, but we have never seen it beyond the lips. In most cases, probably, it lies in its normal position in the mouth.

With respect to the Presence or Absence of *Cutis Anserina* and Retraction of the Penis, which, by some, are considered to be evidence of an act occurring during life, nothing more, in our opinion, can be proved by their presence than that molecular death of the tissues has not taken place at the time of submersion. These signs, moreover, are not peculiar to deaths by drowning, having been seen in deaths from other causes. Both are due to the contraction of involuntary muscular fibre; in the former, to contraction of the muscular bundles in the skin known by the name of *arrectores pili*, and in the latter, to the longitudinal fibres in the cutaneous cellular tissues of the organ. In the skin it shows itself by a puckered appearance, imparts to the sensitive hand a roughened sensation, and the papillæ of the skin can be seen by the naked eye to be elevated above the normal level of the skin. Casper says of the retraction of the penis that he has almost never failed to find it in the bodies of those recently drowned, and has not observed "anything similar so constantly after any other kind of death."

The condition and appearance of the Hands and Feet of a body taken from the water should always be noted. There are certain appearances found on these parts of every body which has lain in water, whether death has been caused by submersion or not—due to purely physical causes apart from the existence of life, viz.: a bleached or sodden condition of the palms and palmar aspects of the fingers and of the soles and plantar aspects of the toes. This is caused by the action of the water on the thickened epidermis of these parts. From its puckered, bleached appearance on the hands it has been called "washerwoman's hand," which it closely resembles; and from its greyish-blue colour and wrinkled character, "cholera hand," from its likeness to the condition of the hand of one dying from that disease. By itself, therefore, the bleached condition above referred to can only form evidence of the body having lain in water for some time. There is one appearance in the hands, however, which, when seen, is of the greatest importance, and that is, the *presence of objects in the firmly clenched hand*—as weeds, grass, sticks, or other objects—which may be found floating in, at the bottom, or on the banks of, the column of water from which the body

has been taken. This almost conclusively indicates death by submersion, as it constitutes a conscious vital act on the part of the person while in the water. The presence of sand, mud, or fine gravel under the finger-nails, to which some attach importance, seems to us, except in very special circumstances, of but slight significance, unless by some special characteristic the identity of the substance with that of the bed or banks of the column of water can be established.

Of the external phenomena, therefore, which may be found on a body taken from water, these only are of substantial importance, viz. :—

1. The presence of a fine froth at the mouth, or nostrils, or both; and
2. The presence in the firmly clenched hand of the person of objects which are to be found in or beside the column of water from which the body has been taken.

After all, however, in order to answer the question with which we started, we must rely upon the internal appearances whereby to return a definite reply.

The prime cause of death being asphyxia, the principal evidence is likely to be found in the lungs and respiratory channels.

Internal Appearances.—Of the appearances of the lungs and air-passages, the following are characteristic of death by drowning :—

1. The increased volume of the lungs. This is at once apparent when the thoracic cavity is laid open, by the lungs bulging out into the freed space, just as if they had formerly been kept down under some degree of tension—for they are distended. This phenomenon is called "ballooning."
2. The appearances of the lung structure on section. The cut surfaces show a copious, watery, bloody, frothy exudation of a dark colour. The exudation is usually markedly copious, indicative of the presence of water.
3. The presence of a fine, clear, or, sometimes, blood-tinged froth in the larynx, trachea, and larger bronchial tubes. When this is present, it unmistakably points to death by drowning, and it is accounted for in this way: during the violent efforts at respiration water enters the air-passages along with a certain proportion of air, and the water, air, and viscid mucus become churned together to form this froth, which is composed of fine air-bubbles. This is essentially a vital act, and the froth when present is proof positive of interference with the function of respiration by a liquid during life.
4. The presence of water in the stomach.

   There is usually a certain amount of water swallowed during the act of drowning when the person is in possession of his senses; but it may not be present when the person is unconscious, even although respiration is going on.

   It will entirely depend upon the condition of that organ prior to and during submersion, whether the watery contents can be identified with that of the drowning medium, for water may have been swallowed copiously immediately prior to submersion. But where fluids, or semi-fluid substances,

of a disagreeable or disgusting character are found in the stomach—liquids which a person would not willingly swallow in any ordinary circumstances—they indicate submersion as the cause of death, where such constitute the drowning medium. For example, where liquid manure, or muddy water, or water containing fine shells, or like substances, is found, valuable aid is afforded to the diagnosis of drowning, where other evidences may be doubtful. Experiments by Riedel and Kanzler on animals show that fluid cannot enter the stomach after death, until putrefaction has advanced considerably. The gullet may, therefore, be looked upon as a canal *in posse* rather than *in esse*, until that time. For this reason, therefore, the presence of water in the stomach becomes of some importance.

The following signs, in a tabulated form, found on a body taken from water, would indubitably indicate death by drowning :—

1. The presence of material clutched firmly in the hand or hands which could only be obtained in the water, at its bottom, or on its banks;
2. The presence in the air-passages of a clear, or blood-tinged, froth, composed of fine air-bubbles;
3. The increased volume, and œdematous and engorged condition, of the lungs;
4. The presence in the stomach of water, or other composite liquid, corresponding to that of the drowning medium, or of substances which float in the drowning medium, such as weeds or fine shells.

It is very usual in this connection to say something relative to the treatment of those in whom animation is suspended from drowning.

The line of treatment may be summarised under the following heads, viz. :—

1. Free the body of its clothing, and the mouth and air-passages of water: wrap the body in blankets.
2. Restore the animal heat of the body by warm applications, frictions, etc.
3. Stimulate the action of the heart and the respiratory nerve-centre.
4. Institute artificial respiration, either by Sylvester's, Hall's, or Howard's method.

The details can be filled in as circumstances suggest.

The next important question upon which the medical examiner may be expected to be able to throw some light is, *Whether was the act of drowning accidental, suicidal, or homicidal?* In very many cases, possibly the large majority, the examination of the body will not help in its solution; indeed, the question only emerges when marks of violence are found upon the body; therefore, the problem must be solved by the criminal authorities. There are, however, certain general indications, attention to which may assist as a guide to the answer apart from the evidence of eye-witnesses; for example, in suicides where there has been a declared intention to commit *felo de se*, or where writings to that effect are found in a pocket of the drowned person.

The question of Accident usually bulks more largely in cases falling under the following classes, viz. :—

1. Among persons whose normal occupation is on or near rivers, canals, reservoirs of various kinds, or who, generally, have to do with harbours or are engaged in boat-traffic, or in the launching of ships.
2. Among bathers, usually in summer.
3. Among intoxicated persons mistaking their way in the dark, or among others, in a fog, and thereby falling into a river, a harbour, or a canal, or falling face downwards into a shallow pool of water, either from the effects of alcohol, of epilepsy, or other such cause; or young children falling into vessels of water, such as wash-tubs, etc.

Among the causes of accidental drowning in the cases we have seen may be enumerated the following :—

(*a*) Children falling into wash-tubs.
(*b*) Adults drowned while pleasure-boating, by upsetting of boat.
(*c*) Intoxicated persons wandering into a canal.
(*d*) Persons wandering in a fog into a river, or canal.
(*e*) Boys drowned while bathing.

One unusual case deserves mention. Several men, some of them more or less intoxicated, were lounging away their time during a strike on the banks of the canal near Glasgow. One of them, an expert diver and swimmer, for a small bet volunteered to dive to the bottom of the canal from the ledge of a bridge near by. Having taken off his clothes he sprang into the water, but he did not speedily return to the surface. On the alarm being given two of his companions dived in after him, and found his body nearly perpendicular to the bed of the canal, his head sticking firmly in the mud at its bottom. When his body was brought out, he was found to be dead. There was a bruise on his forehead, due to his head having come in contact with a stone in the bed of the canal.

But accidental drowning may be accompanied by culpability, as the following case shows. A woman was tried in Glasgow in May, 1901, on the charge that while in a state of intoxication she was unable to exercise reasonable care of her infant daughter of nine months, who, in consequence, fell out of bed into a pail of water standing beside the bed, wherein she was drowned. The jury, however, found the accused not guilty.

The question of Suicide emerges under the following circumstances :—

1. Where stones, dumb-bells, or other weighty bodies are found in the pockets, or attached to the person, and in the absence of any other cause of death.
2. Where the feet, or the hands, or both, are found ligatured together.
3. In cases of persons of known depressed mental condition from any cause, such as grief, or social or commercial disaster, or disappointment, or in cases of persons of known unsound mind. Suspicion is strengthened if a razor, for example, be found in the pocket, especially in the case of women.
4. Where the bodies are found in columns of water of sufficient depth to enable the act of drowning to be easily and efficiently performed. This presumption must be qualified, however, by the established fact that eccentric suicides do drown themselves in very unusual places, such as shallow ponds, a water-bath, or other equally unlikely place, as a water-butt.

The question of Homicide is at once raised under such conditions as the following :—

1. In cases where, upon the banks of the column of water in which the body has been found, there are evidences of a struggle, and especially when articles belonging to other than the deceased person are found on the banks associated with those known to have belonged to the deceased ; or where, grasped in the hand of the drowned person, there are fragments of clothing or hair, not corresponding to those of his own person.
2. In cases where, on post-mortem examination, the usual internal signs of death by drowning are absent, and, where, on the other hand, lesions due to violence are found on the body. It is necessary, however, to bear in mind that suicides who have determined to end their lives may have attempted first of all to cut their throats, or to suspend themselves, but having failed to achieve their purpose, complete the act of self-destruction by drowning themselves.

It ought to be further observed that while homicidal drowning may be comparatively easy in the case of children or other helpless persons, it cannot be so easily attempted or effected in adults who are in possession of their senses, from the likelihood, or from the fear, of detection. Where such is tried the assailants are usually more than one in number.

In those cases in which marks of violence are found upon a body taken from water, it behoves the medical examiner to devote much careful attention to the facts, for it is likely to be asked of him, whether or not the lesions found were produced during life, and, if produced during life, would they alone account for the death. From experience we believe that there are no questions more difficult to answer than these, under the circumstances given. In wounds found on a body which has lain in the air, certain conditions of the wounds themselves and of the surroundings of the body are likely to offer means for an answer. For example, there will be the evidence of hæmorrhage by clotted blood in the wounds themselves, by the blood-stained condition of the tissues exposed in the wounds, by the blood on the clothing, or in the immediate vicinity of the body ; moreover, in incised wounds, there is the evidence of eversion of the edges. But in a body which has been lying in the water, all such evidence as the presence of hæmorrhage above indicated, will be entirely awanting, because it has been dissolved and washed away in the watery medium. Should, however, there be bruises on the body, or bruising in connection with the wounds, the fact that the body has lain in water will not affect their integrity ; hence, we have to fall back upon the everted condition of the edges and the ecchymoses whereby to form an opinion respecting the ante-mortem causation of the lesions. Even these do not warrant us in saying more than that these may either have been produced during life, or just immediately at or after death while molecular life of the tissues existed. But in this connection, the question as to whether wounds upon such a body are of suicidal, accidental, or homicidal origin may be determined by certain local circumstances referable to the water itself. In navigable rivers or canals, bodies when they float—and even in canals especially, before they float, and by reason of the comparatively shallow depths of such water-ways—may sustain injuries not only extensive in character but peculiar in kind, from the revolving screws of passing boats. It was part of our duty for many years to examine the bodies of persons found in a canal subject to much traffic by screw-steamers, and thus we are able to indicate the character and extent of lesions on bodies referable to this cause.

The following cases taken by random from our case-book will illustrate this point :—

CASE 39. Severe and extensive injuries found on body as follows : evisceration of chest organs ; punctured wound on right chest ; fracture of left thigh ; lacerated wound of temple.

CASE 43. Scalp severely torn ; fractures of spine, right arm, and forearm.

CASE 64. Compound fracture of left leg ; simple fracture of left arm.

But in contrast to such cases there are those in which one can only come to the conclusion that death was due to violence by assault and drowning.

CASE 12. This body had been in the water for more than six days. The following marks of violence were found: three incised wounds on the right side of nose, one deep, the other two superficial; six incised wounds on left brow, left temple, eyebrow, and eye; and, in addition, compound fracture of right humerus. Evidence showed that this woman was *virgo intacta*. The compound fracture of the humerus was most probably due to violence from a screw-paddle, but the others were, in our opinion, caused by a knife; other circumstances revealed in the history of the case pointed in the direction of homicide. The case, however, could not be pursued for want of evidence.

CASE 34. Body of a woman, who had previously borne children. The body showed the following marks of violence: a lacerated wound 1½ inches long, on upper right eyelid; a like wound, an inch long, on lower right eyelid; and a compound fracture of right nasal bone. The localised distribution of the lesions pointed either to repetitive blows, or to one blow from an irregular, blunt instrument, but it was impossible to say whether the wounds were produced before or after death.

If decomposition, too, be far advanced on a body upon which the wounds are present, it is impossible to give any opinion as to the ante- or post-mortem origin of the lesions. Should lesions be found on a body taken from a non-navigable river, or other like column of water, grave suspicion of foul play would be bound to arise; hence it is important to consider the character of the column of water, with respect to traffic by boats, or the possibility of the occurrence of accidents, such as falls from cliffs, in arriving at a conclusion regarding the cause of wounds on a body taken therefrom. In conclusion, in any given case the whole circumstances must be duly considered and weighed before any attempt is made to answer the question propounded, and in no case ought an opinion to be given in favour of the homicidal origin of the wounding unless the examiner can show satisfactorily that the lesions could not be produced in any other way, or could be accounted for in the light of other evidence.

II. DEATH BY SUFFOCATION.

In this form of death are embraced those in which death has been caused by impediment to respiration but which is not due to pressure externally and immediately applied to the windpipe. It, therefore, does not embrace death by hanging, strangulation,and throttling, but it includes deaths by smothering or over-laying, those due to foreign bodies in the windpipe or pharynx, and those due to irrespirable gases. It may be the result, therefore, of natural disease, of accident, or of violence suicidally or homicidally applied.

Death by suffocation may be caused, either:—

1. By preventing the action of the muscles of respiration;
2. By mechanical impediments to the entrance of air which are placed over the mouth and nostrils; or
3. By like impediments in the pharynx or air-passages.

It may arise from disease in the following cases:—

1. Tumours in fauces, throat, or larynx;
2. Bursting of pharyngeal or tonsillary abscesses;
3. Effusion of lymph or membranous exudations upon mucous membrane of air-passages;
4. Accumulation of bronchial secretion, as in the bronchitis of young children or elderly persons;
5. Rapidly accumulating pleural effusions, especially if bilateral;
6. Pulmonary œdema;
7. Copious hæmorrhage into bronchial tubes, as in phthisis; and
8. In cases similar to the foregoing.
9. From *Laryngismus Stridulus*.
10. Convulsions.

It may likewise result from such accidents as the following :—

1. Mechanical pressure on chest walls sufficient in degree to produce fixation of thoracic walls, as in fallen persons in panic-stricken crowds, in some cases of over-laying, in falls of sand or other material in sandpits, mines, collieries, or buildings; or from hoist-accidents, in cities;
2. Impaction of materials in pharynx or larynx. This is by no means uncommon in intoxicated persons who attempt to swallow imperfectly masticated food-stuffs. The impacted material may consist of (*a*), imperfectly masticated food, as tripe, or flesh meat, or chop bones; (*b*), of plates of false teeth; or (*c*), objects which may be inhaled, or driven, into the air-passages during play or otherwise, such as the rubber toys, or squeak balloons of children;
3. The overlaying or overlying of infants;
4. From "smothering"; where, for example, persons in a fit, or in any other helpless condition, fall face-downwards on a comparatively yielding surface, such as a bolster, mattress, or thick rug;
5. From breathing irrespirable Gases, as H_2S, NH_4HS, Chlorine, CO_2, CO, and Coal-gas; also from smoke in burning buildings; or from the vapours of Iodine, Bromine, and Ammonia.

It may also be caused homicidally as follows :—

1. From "Burking"; where pressure is applied at the mouth and nostrils, with fixation of the lower jaw, at the same time as fixation of the chest walls is produced by the weight of the body of the assailant. This was the method of the notorious Burke and Hare;
2. As a mode of Infanticide; by stuffing foreign bodies into the mouth and pharynx of newly-born infants, such as paper, or dough or other plastic substance;
3. From Culpable Overlaying of Infants.

Post-Mortem Appearances.—The proximate cause of death being Asphyxia, the reader is referred to a former chapter for the signs of death from that cause. But there are certain points to which special attention must be paid in this connection; as, for example, the absence of uniformity in the external appearances. It is usual to describe the facial appearances in this form of death as follows: the face generally shows a more or less livid colour and congested appearance, the eyes are staring, the conjunctivæ blood-shot, the lips dark-coloured with a bloody froth issuing from the mouth, from which, also, protrudes an equally dark-coloured tongue.

It ought to be clearly understood that while it is true that these conditions may be found in *some* cases of death by suffocation they are by no means found in all. Indeed, on the other hand, another set of facial appearances altogether are found, viz. :—

(*a*) A more or less normal appearance of the face;

(*b*) Absence of marked signs of congestion either of eyes or of lips, and absence of protruded tongue.

In short, the only sign approaching evidence of interference with the due aeration of the blood in such cases, is a *bluish tint of the lips and mucous membrane of the mouth*, along with, in children especially, *a livid tint of the nails of fingers and toes.* Yet in both classes of cases the proximate cause of death is Asphyxia, as clearly indicated by the internal appearances. How is this to be accounted for? It is quite clear that the time occupied in the asphyxiating process must vary in a series of cases, and it is equally clear that the rapidity or slowness with which the process is completed will determine, in large measure,

the external appearances and their incidence. From our observations, we are inclined to formulate this guiding rule—that the more rapid and complete the asphyxiating process is, the more marked are the external appearances of lividity; and the converse is equally true. From the external appearances alone of a body, therefore, it is difficult to say whether death has been caused by Asphyxia, except in those in which external lividity of face, lips, etc., is well marked.

In addition to the main signs of death by Asphyxia already discussed in a former chapter, some light may be thrown upon the cause of death by noting particularly the following points, viz.:—

I. *The Colour and Consistency of the Blood.*—In all deaths by asphyxia the blood is unusually fluid, and, *en masse*, is always much darker in colour than normal. But in deaths from the respiration of Carbon Monoxide, the colour of the blood is a cherry red, not only in the main blood-vessels, but in all the organs of the body, due to the formation of a stable compound between the gas and the hæmoglobin. In deaths by CO_2 gas, the blood though darker, does not indicate the production of a compound between that gas and the hæmoglobin, although immediately after death, such has been found in the blood of the heart; but it is of very evanescent existence.

II. *The Presence or Absence of Punctiform Capillary Ecchymoses on the Pleuræ, either pulmonary, costal, or diaphragmatic, and cardiac.*—In most of the cases of suffocation of children, and in certain of those in adults, such are found; and, in addition, ecchymoses in other situations, as into the conjunctivæ, are also found.

In medico-legal practice, deaths from Suffocation may be resolved into those that are (*a*) Accidental; (*b*) Suicidal; and (*c*) Homicidal. The use of the term "accidental" is here employed not so much in the legal as in the popular sense; for it is obvious that many cases may at first sight appear to be accidental which, on closer investigation by the law authorities, may involve varying shades of culpability.

Of the so-called accidental causes, then, the chief, perhaps, are—

1. From panic-stricken crowds in public buildings or elsewhere. Hardly a year passes without the occurrence in some populous centre, at home or abroad, of a catastrophe of this kind. Illustrative of these may be cited the following:—
   (*a*) That of the opera-house at Milan;
   (*b*) That of a Sunderland Theatre in June 1883, where over two hundred children lost their lives in a stairway during a stampede; and,
   (*c*) That of the Star Theatre, Glasgow, in which several young men and older adults lost their lives, the bodies of whom we examined.
2. From Suffocation by Irrespirable Gases.
   Such deplorable occurrences periodically occur in coal-pits; and many other sources might be named.
   (*a*) Deaths from H_2S and NH_4HS in sewers.
   (*b*) Deaths from Ammonia gas, in artificial freezing works.
   (*c*) Deaths from Coal-gas. These occur in many circumstances, the prime cause of death being the CO gas which illuminating gas contains, and which will be referred to under the heading of Carbon Monoxide.
   (*d*) Deaths from Carbon dioxide (CO_2), in fermenting vats, in gas-holders in aërated-water manufactories; and in various other circumstances.
   (*e*) Deaths from Carbon monoxide. This may occur in a great variety of ways, from collections of choke-damp in coal-pit workings, wells, or shafts; after explosions of enormous charges of gunpowder; from sleeping in the neighbourhood of lime-kilns, or upon smouldering heaps of "blaise" from iron or steel works; in bath-rooms, where the water

is heated by means of "gas geysers"; from coal-gas inhalation; from entering coal-tar stills or tanks, or boilers.

3. From collapse of sand-pits, graves, and of other masses of loose material.
4. From weak and helpless persons and persons in fits falling upon their faces upon soft material, as clothing, or clay, or mud.
5. From the overlaying of children.

This is, unfortunately, too common an occurrence amongst certain classes in our populous centres. It is due to two main causes, viz.: the drunken habits of those classes, and the lack of sufficient house accommodation. The English Registrar-General states that almost one case a day happens in London alone; while not a year passes in any populous centre in this country without a considerable number of deaths of infants being due to this cause alone. Most usually, the offender is a parent, but in three or four of the cases which we have examined the overlaying was done by an older child who was sleeping in the same bed with the infant; in very odd cases, it may not be due to intoxication but to helplessness on the part of the mother from paralysis; in one case which we investigated the mother was hemiplegic, in fact she had been seized with this during her confinement, and her neighbour, who was acting as nurse, had thoughtlessly put the infant to suckle at the breast.

6. From blocking of the air-passages by foreign bodies. In addition to the causes already enumerated must be put that of regurgitation of vomited matters into the air-passages from vomiting during the helpless condition of a drunken debauch.

The foregoing list of conditions is only intended to be indicative of the more commonly occurring causes, and has been compiled mainly from our own experience in the examination of a large number of cases.

During our medico-legal experience we have examined the bodies of 92 persons in which suffocation was the cause of death, as indicated by the signs of asphyxia.

The following Table shows the incidence and the causes:—

Table of Deaths from Suffocation.

Bodies of infants found dead in bed beside their parents	52
Bodies of persons where fixation of chest walls was produced by falls of material	2
Bodies of persons where fixation of chest walls was produced by being caught between buffers of railway vehicles	2
Bodies of persons who died from Fit, or other like seizure	8
Suffocation from piece of Meat in Throat	1
Suffocation from vomited matter in windpipe	1
Suffocation from vomited matter in windpipe, produced by assault (kick in stomach)	1
Deaths from CO and CO_2 gases—	
On blaise-heaps	2
From lime-kilns	3
In a boiler	1
Deaths from coal-gas	7
Smothering in pillow or bedclothes or otherwise, of intoxicated persons, or the aged; or from other causes	12
	92

This list does not include several bodies whose death was caused in a panic-stricken crowd.

Suicidal suffocation by mechanical means we believe to be very uncommon. It is difficult to comprehend the possibility of the occurrence of such cases. Such, however, have been recorded by foreign writers of persons who, by stuffing cloth-fabrics into the pharynx,

is heated by means of "gas geysers"; from coal-gas inhalation; from entering coal-tar stills or tanks, or boilers.

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have produced this result; or have attained the same end by shutting themselves into air-tight trunks or cabinets. In Horfield gaol, a prisoner recently committed suicide by forcing a piece of cloth down his throat by means of a wooden spoon. It was thought that the man had placed the cloth in his mouth and pushed it back by lying down and pressing the bowl of the spoon against the floor. The song of "The Mistletoe Bough," it will be remembered, is founded upon accidental suffocation produced in an air-tight trunk. But suffocation is effected suicidally in other ways, viz.: by the inhalation of irrespirable gases produced from charcoal brasiers, or by coal-gas being turned on in a room.

Homicidal suffocation may be produced in the case of the young—it is one of the forms of infanticide—and of those who are helpless from alcohol, or other like narcotic, or from age. The earliest recorded case of this kind is found in the Scriptures of the Old Testament, in 2 Kings, chap. viii. v. 15. "And it came to pass on the morrow, that Hazael took a thick cloth, and dipped it in water, and spread it over Ben-hadad's face, so that he died: and Hazael reigned in his place." From the context, we are informed that the victim was an old man, and helpless.

The tragedies of Burke and Hare were produced by suffocation. The mode by which they killed their victims, as proved at the trial for the murder of Marjery Campbell, was "by sitting on her body, covering the mouth and nostrils with one hand, and applying the other forcibly under the chin."

Sir Henry Littlejohn[1] records a most instructive case in which he made the post-mortem examination of the victim. He found a quart-bottle cork, in which were the marks of a corkscrew, impacted in the upper part of the larynx of the woman, the sealing-wax end of the cork being uppermost. Some of the ribs were found fractured. It was pleaded for the defence that the cork had been accidentally drawn into the windpipe while the woman was in the act of drawing the cork from the bottle with her teeth; but this was rebutted by the position of the cork and by its corkscrew marks. The jury, however, from insufficiency of evidence in the identification of the prisoners as the assailants, returned a verdict of "not proven." In another case, recorded by the late Dr. Easton of Glasgow, mud had been forced into the windpipe of a newly-born child; and in another case, the first-named observer discovered a mass of dough in a similar position in another infant. In a charge of infanticide preferred against a woman at the Northern Circuit in Scotland, it was proved that she had caused the death of her newly-born child by forcing pieces of paper into its mouth. In a recent case, we made a post-mortem examination of the body of a man who met his death in the following way: the deceased and the accused, both intoxicated, quarrelled, and in the course of the fight, which up till then appeared to be harmless of injury to either of them, the accused kicked deceased in the stomach. The deceased fell and did not rise; on being lifted, he was found to be black in the face and dead. The necropsy revealed the air-passages to be full of a vinous liquid corresponding to that in the stomach. There was not a trace of violence on any part of the body. We gave it as our opinion that the cause of death was suffocation due to the fluids in the air-passages which might have been forced up into the throat by the kick and which then regurgitated into the windpipe. The accused was found guilty of assault.

In cases of overlaying, culpability of the parents is involved where it can be proved that they were in a drunken condition when the child was overlain, and where ~~the cause of~~ the death is proved to have been caused by asphyxia. It is not enough, however, to prove these points; it is necessary that the prosecutor should prove that the asphyxia was produced by over-laying, and that this was culp-

[1] *Edin. Med. Journal*, Dec. 1885, pp. 511–540.

ably caused by the condition of the parents. This is a very difficult matter to prove; and it is for this reason that so few parents, whose infants have been found dead in bed beside them, are brought to justice. In the examination of the bodies of such infants, it is most frequently the case that the examiner can affirm nothing more than that death occurred from suffocation; it sometimes happens, however, from marks of pressure on the face—pressure marks of clothing, or compression of the nose—that he may be able to say that, probably, the cause was over-laying. Of the 52 cases which we have examined, it was but rarely that the face showed marked evidence of lividity. In most of them the face generally was either normal, or but slightly dusky; but in all of the cases there was more or less lividity of the lips and mucous membrane of the mouth, and of the nails of fingers and toes. In several of them there was clear or blood-tinged froth at mouth or nostrils or both, and in nearly all of them was there some degree of protrusion of the tongue, that organ usually being protruded to some extent beyond the line of the gums. In all the cases of smothering there was very marked lividity and congestion of the face—ranging from a purple-black colour to a pale lividity—bloody froth at mouth and nostrils, lividity, in marked degree, of lips and mouth, and protrusion, more or less, of the tongue. In any case, moreover, in which suffocation is suspected, attention should be strictly paid to the colour of the post-mortem lividity. Any one who has once seen the rosy-coloured hue of this in cases of carbon monoxide suffocation will never forget it; but this usually indicates the presence of a considerable percentage of the gas in the atmosphere breathed, for although this gas is the intimate cause of death in coal-gas suffocation, the rosy colour of the post-mortem lividity is not apparent. In addition to this and the arterial hue of the blood of the body generally, spectroscopic examination of the blood must be made in the manner to be hereinafter described in the discussion on Blood.

III. DEATH BY HANGING, STRANGULATION, AND THROTTLING.

Hanging may be defined as that form of death which is caused by suspension of the body in a ligature which more or less completely encircles the neck, the constricting force being the weight of the body itself; Strangulation, as that form of death which is caused by a constricting force applied circularly round the neck; and Throttling, that form of death where the constricting force is applied locally to the windpipe, the force being the hand or fingers of an assailant.

Hanging is, perhaps, the most common method by which suicide is effected. Of the total number of suicides in England and Wales between the years 1865–1894, it accounted for 34 per cent., and in Scotland, between 1877–1894, for 29 per cent. It would appear, therefore, from the returns for England for thirty consecutive years, that, as a mode of suicide, it prevails more in that country than in Scotland. In passing, it may be noted that Sibbald[1] has shown that as regards suicide generally, if a line be drawn on the map of Scotland from the Moray Firth to the Firth of Clyde, the lowest rates obtain in those counties which lie north-west of that line—in other words, that suicide is more common among the Saxons than the Celts.

In these forms of death—leaving judicial homicide by hanging out of count for the present—the usual proximate cause of death is asphyxia, or, more particularly, comato-asphyxia.

The time occupied in the process before life is extinct depends mainly upon two factors, viz.:—

(*a*) the severity of the constricting force; and
(*b*) the point of application of that force.

[1] *B. M. J.*, vol. ii. 1898, p. 691.

The amount of the constricting force in hanging depends upon whether or not the body is completely suspended, since it will be greater the more weight is thrown upon the ligature. The point of the application of the force has somewhat to do with the post-mortem appearances found on the body after death, and also with the time occupied in dying, because of the amount of compression exercised on the large blood-vessels of the neck.

The experiments of Fleischmann[1] on himself show, at least, that the degree and rapidity of onset of suffocative symptoms produced are largely influenced by the situation on the neck of the ligature. When the ligature was placed between the lower jaw and the hyoid bone and was moderately tightened, the effect was to disturb the breathing, which, however, continued; but by the end of two minutes, he had to be disengaged from the noose. When it was placed over the larynx, the experiment had to cease at the end of 1½ minutes; and when it was placed over the cricoid cartilage, the experiment could not be borne for even a few seconds, because of the great embarrassment to respiration. Gosse has also shown by experiments on himself, that unconsciousness may be produced without undue pressure being caused on the air-passages. The effect of a ligature constricted round the neck is primarily the occlusion, more or less, of the air-passages, and the prevention, more or less completely, of air entering the lungs; and secondarily, by its incidental compression, in varying degree, of the main blood-vessels of the neck, the disturbance of the circulation between brain and lungs. It is likely, also, that the actual condition of the breathing at the moment of suspension will be a factor in the resulting blood-state of those organs; but in any given case this cannot be known, and, therefore, may be neglected from the practical point of view. Further, the amount of compression which is bound to be exercised on the phrenic and vagus nerves must be an important factor in the causation of death. Apart altogether from implication of respiration a person may die from the effects of suspension. This is well shown in a case recorded by Reineboth,[2] where a man, upon whom tracheotomy had been performed for malignant disease of the throat, suspended himself by the neck, the line of ligature being above the site of the canula which was at the time in position. On post-mortem examination no signs of death by asphyxia were found, but the blood-vessels of the base of the brain, and the substance of the pons and medulla were found engorged with blood. In the bulk of cases of suicidal suspension the ligature will be found either between the thyroid cartilage and the hyoid bone, or between the latter and the lower jaw; and the effect of the more or less vertical suspension by a cord in either of these situations is to jam the soft structures together—the floor of the mouth against the roof—so as more or less effectually to cut off the entrance of air. As in deaths from asphyxia from any cause, so in these forms the heart continues to beat for a few minutes after the cessation of respiration, and, therefore, attempts at resuscitation of a suspended person may prove successful if the body be cut

[1] Ogston, *op. cit.* p. 524.
[2] *Vierteljahrsschrift für gericht. Medicin.*, 1895.

down within five or six minutes after the act of suspension; beyond this period, there is but little chance of success in the re-establishment of breathing. Scott, the famous American diver, gave public exhibitions of suspension and its effects upon himself; but he did it once too often: on his last appearance in this rôle, he was permitted to hang for thirteen minutes, but all efforts thereafter for his resuscitation proved unavailing. Dr. Chowne[1] relates that a man named Hornshaw performed in public in the like way on three different occasions, but was successfully resuscitated each time. It will be remembered, too, that in his novel of "The Black Dwarf," Sir Walter Scott deals with the rescue and resuscitation of a person who had been suspended.

In the examination of the body of any person found suspended, there are three separate parts of the line of inquiry as to the cause of death which demand special consideration—

I. The General External Post-Mortem Appearances;
II. The Local Conditions of the Neck;
III. The General Internal Post-Mortem Appearances.

Under the first, the condition and appearances of the following parts of the body deserve careful attention, viz.:—

1. Of the Face.
2. Of the Genitals.
3. Of the Rectum and Urinary Apparatus.

I. The General External Post-Mortem Appearances.

1. *The Condition and Appearance of the Face.*—In Guy and Ferrier's work[2] the following picture is drawn of the facial appearances: "The eyes are brilliant and staring, and seem to be bursting from their sockets; the eyelids open and injected, and the pupil dilated; the tongue, swollen and livid, is forced against the teeth, or more or less protruded from the mouth, and compressed or torn by the contracted jaws; the lips are swollen and the mouth distorted; and blood, or a bloody froth, hangs about the mouth and nostrils." We have quoted this for the purpose of affirming that the description does not conform to the usual experience; it certainly does not accord with our own nor with that of other observers. In most of the cases which we have seen, the eyes have either been shut or partially open, the pupils in all cases dilated; the position of the tongue has varied from that of normal to that of protrusion more or less beyond the line of the teeth, and in no case have we seen it torn, or any appearance of blood or a bloody froth about the mouth or nostrils. A more accurate general description would be as follows: The face is usually pale, but may be dusky in hue, the eyes are either shut or partly open, the pupils usually dilated, and the tongue may either be normal in position or be protruded more or less in front of the line of the teeth. The lips are ordinarily bluish in colour, and the tongue may share the like coloration. Professor Ogston[3] gives a record of 40 cases of deaths by suspension, of which 36 were suicidal and 4 judicial. In 21 cases, the features had a look of calmness and placidity, while in only one suicidal case had they the appearance of anxiety. "In none of the cases did the colour of the face present anything characteristic. In

[1] *Lancet*, vol. i. 1847, p. 404. [2] *Op. cit.*, Fifth Edit. p. 288. [3] *Op. cit.* p. 527.

only one case was prominence of the eyes encountered. In 39 of the cases the pupils were more or less dilated, while in one they were contracted." In our own series of cases, the only two phenomena which were constant in all were: (1) Pale bluish lividity of lips and mucous membrane of mouth and tongue, and, (2) dilatation of the pupils. It will be observed that both of these signs are common to all deaths by asphyxia, whatever be the nature of the determining cause.

2. *The Condition of the Genital Organs.*—Medical jurists are divided in opinion as to whether the male genitals after this form of death are in a state of turgescence with emission of semen, or are in an opposite condition. That the former condition is not constant is apparent from the recorded observations of different writers. Casper, for example, says of the many cases which he has examined, that he had not found in any case any evidence of genital erection, and has but rarely seen a condition of even semi-erection. Guyon,[1] on the other hand, states that of 14 males who were hanged at the same time, in all of the bodies was erection observable. Devergie never saw either erection or semi-erection after suspension. Ogston states that 11 of his 40 cases showed genital excitement, 7 to the extent of full erection and 4 of semi-erection. In the series of cases which we have seen, in which were 11 males, no such genital disturbance was manifest. It may, therefore, be taken that genital excitement is an inconstant phenomenon. It has also been asserted that seminal emission has been seen in certain cases. Ogston says of 8 of his 40 cases that "seminal fluid had been discharged," but he does not indicate whether that opinion was arrived at from the merely physical appearances of the fluid or from microscopic examination. We have seen fluid at the *meatus urethræ* in nearly all our cases, but in none of the cases did microscopic examination reveal spermatozoa.

3. *Condition of the Rectum and Bladder.*—Ejection of urine or fæces, or of both, is by no means infrequently found in cases of hanging in females, but loss of power of the sphincters is common to all deaths by asphyxia. It is, however, met with in other forms of death; we have seen ejection of both, for example, in sudden death from syncope.

Probably very important evidence will be derived from careful examination of

II. **The Local Conditions of the Neck.**—The incidence and character of the markings on the neck may afford some indication of the manner by which death has been produced. It is very advisable that all marks on the neck should be critically examined in order to see whether death is really attributable to suspension, or whether it has been due to throttling first and suspension afterwards. Any indication of scratches must be noted with relation to the question whether or not they were likely to have been produced by the ligature; for example, scratches on neck or face in presence of a soft plastic ligature would be bound to evoke suspicion. The line of the ligature, also, must be carefully noted. Usually, in suicidal suspension, it follows the line of the lower jaw, then passes obliquely upwards behind the ears, where

[1] *Révue Médicale*, 1823.

it is commonly lost. But it is obvious that this will entirely depend upon the situation of the noose; for example, if the noose be at the back or side of the head, which is very common, the line of mark would in all probability be as already indicated, but if, on the other hand, it be under the chin, then its incidence would be entirely different. The reason for the ligature line being close to the lower jaw in the bulk of cases is due to the very simple fact that as the body sinks in the act of suspension the ligature will gradually slip up the neck until it attains a point of fixture, which is the line of the lower jaw; but, here again, the relation of the body to the point of suspension and to the floor or ground must be considered, since a variety of angles will be produced so as to affect the incidence of the point of constriction. We have seen the front line of the mark cross, in one instance, the thyroid cartilage, and, in another, over the hyoid bone; but in the bulk of our cases the mark was situated as described, between the hyoid bone and the line of the lower jaw.

It is well to bear in mind, further, that a suicide may pass the ligature twice round the neck before he suspends himself; in which case there will be a double mark, viz.: one more or less circular, and another, oblique. Again, a composite ligature may be used, such as a thin rope doubled, or a series of strands of cord. All of these factors indicate different marks which, unless borne in mind in the examination of a body which has been cut down, may at first produce confusion in the mind of the observer. In all such cases, therefore, the ligature itself ought to be inspected.

In strangulation, the ligature line takes a circular course round the neck, and it is apt to be lost at some particular part of the neck, either at back, or front, or on one side; there are, however, exceptional cases in which the circular mark is complete.

In throttling, the marks are ordinarily found on the lateral aspects of the larynx or trachea, and usually correspond to a thumb mark on one side, and a larger mark, or series of marks, on the other, due to the compression of the fingers. Where the hands of the assailant have been applied from behind the victim, on the other hand —in which case compression will be applied all round the neck—the mark will correspond more to that of strangulation, and is likely to be more linear, comparatively, in front than behind.

From the mark on the neck, therefore, may be inferred in a general way the character and the incidence of the ligature, in addition to its mode of application. In examining the body of a man who had suspended himself from the knob of a window-shutter about four feet from the floor, while his companion was asleep in bed in the same apartment, we found a very unusual form of mark. On the left side of the neck it appeared as a single furrow, but on the right side it was composed of three separate furrows, with little intervening ridges of skin, which were of a livid-blue colour. The explanation was that the man had used a series of strands of ordinary ham-string as a ligature. In cases of suspected infanticide where a mark is found on the neck of the infant, it is necessary to recollect that it may be due to constriction produced by the umbilical cord during the act of birth. By reason, however, of the comparatively soft structure of which the

cord is composed, and of the less amount of constriction which it can exercise under ordinary circumstances of parturition, the mark is not usually deep, and it does not cause the indurated effect, or the parchment-like, dry appearance of an artificial ligature mark; therefore, in many cases, it may be differentiated from a ligature applied with homicidal intention; this, at least, is our experience.

Moreover, there may be indications in the vicinity of the mark which will point to the nature of the ligature used—where the ligature itself is not available for inspection—such as scratches or abrasions. These may have been produced by a rough, coarse ligature, or in some other way, such as by the finger-nails of the victim who may try before loss of consciousness supervenes to undo the constricting force, or by the finger-nails of an assailant in throttling.

The colour characters of the ligature mark also vary.

They have been divided into four kinds, viz.:—

1. Those of a dirty-yellow or pale-brown colour—the mummified or parchment-like mark;
2. Those of a bluish or dirty-red colour;
3. Those of a dark-blue or purplish colour;
4. Those without any colour whatever.

These colour-markings, at one time, gave rise to considerable discussion among medical jurists with respect to their bearing on the questions of suicide or homicide, and of origin before or after death. The general opinion now, however, is that in the large percentage of cases, the mark and its attendant appearances are purely post-mortem productions. This, however, is not true of every case. It is especially not true where ecchymosis is found in the mark, because its presence indicates that the violence which produced it was operative either during the life of the victim, or was applied immediately after death while molecular life of the tissues existed. The consideration of this question opens up a very large question which is apt to arise in all cases of death by asphyxia, viz.,—whether ecchymoses may not appear in a more or less limited fashion on the external surface of the body from purely natural causes, and quite apart from violence. We have, for example, seen such spontaneous ecchymoses on the conjunctival mucous membrane in cases of drowning, but we have not personally observed them in the cases now under discussion. Consideration of the larger question is deferred until the effects of violence are considered.

As to the kind of ligature employed, the suicide is not particular; he is apt to take what is nearest at hand suitable to his purpose. Ropes, probably, are most common; but we have seen a bundle of ham-strings, a woollen cravat, and a leather belt serve the purpose equally well. To these may be added pocket-handkerchiefs, bandages, braces, leather straps, twisted straw-bands, sleeves of jackets, bed-sheets, and other materials.

III. **The General Internal Post-Mortem Appearances.**—In the main, these point to death by asphyxia, or rather, by comato-asphyxia, for it is but rare to find the signs of asphyxia alone. Here, as in death by Suffocation, sub-pleural punctiform hæmorrhages may be found, in addition to the signs already described.

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STOPPAGE OF THE HEART IN DEATH FROM VI

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Recently in reading Dr. Inman on the Theory and Medicine, I came across the following passage:[1]

"After death the heart ceases to act at all, and is simpl bag. But it is to be noted that if an animal is killed in the perfect health, and the heart is immediately separated body, it will continue to pulsate for a considerable period. that it is the same in man. Now, if we examine the heart so stanced, and watch the gradual diminution of its beats, we sh them *irregular* before they cease finally, and that, when they apparently ceased entirely, they may be reproduced by direct i tion or stimulation. Hence we infer that one of the pheno attending the process of dying in the heart is irregularity action; and as we know that a dead heart cannot propel at all, so we have reason to believe that, during the gr loss of its vitality, there must be a diminution in the force contraction.

"The duration of time between the period when the heart full health and when it is entirely dead probably varies in dif animals or individuals; but in the majority of instances it is ciently long to enable us to prove that *loss of power* generally, universally, *precedes* irregularity of action; and there is reas believe, in many instances, that when there is deficiency of c power the amount of the first irregularity is such as to be inco ible with continued life. Hence, in our own species, w infrequently have diminished circulating power, as the only shown by a dying or debilitated heart."

This passage brought to my mind some observations I had of a death from hanging on July 10, 1897, and I now transcri notes I recorded on that occasion, when it was my duty as n officer to her majesty's jail to attend a criminal on the scaffc certify to the execution.

The subject was a medium-sized, thick-set, well built aged 40 years, accustomed to outdoor life, in good health, an no abnormality of the heart. On the lever being pulled executioner, he dropped without a sound and hung without a

[1] "Foundation for a New Theory and Practice of Medicine," by Thomas Inn Lond., Physician to the Liverpool Royal Infirmary. 2d edn., London, 1861; p. 192.

Judicial Homicide by Hanging.—The sentence of death which is pronounced by a Judge upon a prisoner who has been found guilty, after trial, of an offence punishable by the extreme penalty of the law, is a statutory one, and, generally, is to the effect that the guilty person shall be carried from the bar to the prison of ——, thereafter to be detained till the —— day of —— next, and upon that day, between eight and ten o'clock of the forenoon, within the walls of the said prison, by the hands of the common executioner, shall be hanged by the neck upon the gibbet until he be dead; and the body thereafter shall be buried within the walls of the said prison. This is pronounced for doom, and may God have mercy on his soul. During the delivery of the sentence the Judge must wear the "black cap." In Scotland, not less than 15 days or more than 21 days after judgment, if south of the Forth, and not less than 20 or more than 27 days, if north of the Forth, are the periods of time fixed by statute.

In 1765, when Blackstone published his "Legal Commentaries"—a work which is still a classic—no fewer than 160 offences were punishable by death. This state of things existed till 1832, when, on 11th July of that year, Parliament passed an Act abolishing the punishment of death for the majority of these offences, and substituting lesser punishments in its place (7 & 8 Geo. IV. cap. 29).

As the consequence of that Act, there are now only four crimes punishable by death in England, viz.:—

(*a*) High Treason.
(*b*) Murder.
(*c*) Piracy with Violence.
(*d*) Burning of His Majesty's Ships, Magazines, or Arsenals.

But in Scotland, the list is much larger, viz.: *Assault under the Act of* 10 *Geo. IV. c.* 38; *Beating and Cursing Parents* (*Act* 1661, *c.* 20); *Hamesucken; Robbery; Stouthrief; Rape; Incest, and Unnatural Offences; Wilful Fire-Raising; Piracy; Plagium; Furtum Grave; serious Thefts; Horse Stealing; Cattle Stealing; and Sheep Stealing* (*if more than one sheep*). In these cases, the prosecutor, before sentence is pronounced, usually records a restriction of the pains of law. But the pains of law are unrestricted for murder. From the sentence pronounced, therefore, it will be seen that it is not fulfilled until the person be dead, and that, if in the act of carrying it out the rope should break, the act must be repeated, unless His Majesty's clemency be extended to the prisoner. Both of these incidents have happened. In every case of judicial homicide, a medical man is appointed to be present at the execution—usually the surgeon of the prison in which the execution takes place—after which he must examine the body from its external appearances only, as a post-mortem dissection is not permitted, in order to certify at the inquest which is held thereafter, later in the day, that the person who has been executed is dead according to law.

The object of the public executioner in this country is to produce rapid, if not instantaneous death, either by dislocating or fracturing the upper cervical vertebræ. This is effected by that functionary by the adoption of two measures, viz., (*a*), the arrangement of the rope; and (*b*), the drop, or fall in which the body at the end of its descent receives a violent jerk. Calcraft used a short drop of about two feet, and arranged the noose so that the knot or metallic ring was placed immediately below one of the ears. Marwood, his successor, used a drop averaging about six feet, and placed the rope eyelet under the chin, so that the head, at the point of arrest in descent, should be violently jerked backward. The present executioner regulates the drop according to the weight of the person to be executed, and arranges the rope—which must bear a strain of two tons—after the fashion of his predecessor.

The lesions which result from judicial homicide most usually are: (1), Dislocation or Fracture of the upper cervical vertebræ; (2), Rupture of spinal cord, near its junction with the brain; (3), Rupture of cervical muscles; (4), Dislocation or fracture of laryngeal cartilages; (5) Other minor lesions. It sometimes happens, however, that more extensive lesions than these are produced. At an execution in Worcester a few years ago, the head of the victim was partially severed from the body, a gaping wound of the neck being produced; on rarer occasions, also, the head has actually been completely severed from the body. The following were the appearances seen on the bodies of two men upon whom the capital sentence had been performed. The first was that of a man who was executed at the legal hour of 8 A.M., whose body was cut down at 10.30 A.M. The face was pale, the fore-

head slightly livid, the eyes nearly closed, the mouth closed, the tongue was not protruded, the pupils were dilated. The mark of the noose was livid; and on the right side of neck, above and below the ligature, the tissues were swollen and œdematous. Posteriorly, the physical signs indicated luxation of the spinal column, with or without fracture. The second was also that of a man. Immediately after the drop was given, the body gave no sign of muscular movement of any kind. The body was cut down at 9 A.M., and the following were the appearances found: There was a very slight degree of lividity all over the body, especially on the hands; the face was pleasant to look at, and there was no degree of swelling. The lips were pale, and the mucous membrane of the lips, grey. The pupils were slightly dilated and equal. There was a slight abrasion of the skin of the face on the left side near the angle of the lower jaw, obviously caused by the gun-metal eyehole of the rope. Below the jaw, and encircling the neck, was a constriction forming a groove round the neck. It was not deep, but it was broad—about one-eighth of an inch in depth and three-eighths of an inch broad, and was twice as broad on the left as on the right side. The head could be moved in all directions with ease. On the left side of the neck, between the mark of the rope and shoulder, the muscles and tissues felt hard like bone, probably due to rupture. Close to the junction of vertebral column and head, a gap was found into which the knuckle of the forefinger could easily be put. Four hours later, *rigor mortis* had developed in the neck and lower jaw, the latter being fairly stiff. The body was, thereafter, buried within the prison walls in terms of law.

In judicial executions in other countries where suspension is practised, it would appear as if the object of the suspension was to produce death by suffocation rather than death by shock. In an execution in Vienna of a notorious murderer, the following was the manner in which the sentence of death was fulfilled. The executioner had two assistants who placed the victim in position on the scaffold. The executioner himself, who wore a tall hat and brown kid gloves and was dressed in black, jumped to the top of the steps behind the suspended victim, whipped a white silken loop out of his pocket, passed it over the top of the spike (at the top of the scaffold) and under the throat of the condemned man, and finally commenced to compress his face. With his left hand over the jaw and mouth, and his right hand over the forehead and eyes, he squeezed vigorously. One of the assistants meanwhile hung on to the hands of the culprit, and the other, kneeling on the ground, seized his legs, and with both hands pulled them downwards with his whole strength. It took the criminal four minutes to die. In another execution in the same city of a young vigorous man of twenty, death was only accomplished at the end of thirteen minutes.

In Spain, the judicial form of homicide is strangulation, which is produced in this way: the victim is placed in a stout chair on the back of which is a pillar or post, to which is affixed a steel collar or *garrote*. This collar being adjusted round the neck of the victim, the executioner, who stands behind the victim, by manually turning a screw tightens the collar, and so produces strangulation. In Turkey and other Eastern countries, strangulation is effected by means of the bow-string.

One of the first practical questions which the medical examiner is expected to answer is: Was the person alive before suspension, or, in another form, Has the body been suspended to cloak some other form of homicidal death? Before arriving at a conclusion, careful attention must be paid to every detail, because, occasionally, it is not a simple question to answer. If the internal post-mortem appearances point to death by asphyxia, then special attention must be paid to the marks upon the neck. The reason for this will be apparent when it is stated that a person may have been strangled and the body thereafter suspended; and as the signs of death from asphyxia will be seen in both, no light will be thrown upon the *cause* of the asphyxia. Dr. Goose, at the International Congress of Forensic Medicine, 1889, mentioned a case in which his suspicions were aroused by the presence of two marks on the neck, and what might easily have been mistaken for suicide was

found to be a murder.[1] The marks upon the neck may enable an examiner to decide. It is difficult to lay down hard and fast rules for guidance, since a ligature put twice round the neck may simulate the circular mark of strangulation and the oblique mark of suspension. If, however, the examiner sees the body *in situ*, or, at least, with the ligature attached to the neck, he will be able to decide the question at issue by a consideration of the relation of the marks on the neck to the possibility of their being produced by the ligature found. If a body be found suspended, and on post-mortem dissection the signs of asphyxia are absent, one would be justified (except in such a case as that recorded by Reineboth, *vide ante*), in concluding that death did not occur from suspension, and, therefore, the examiner in the absence of marks of violence should look carefully for another cause of death, such as poisoning. Where marks of violence are discovered on a suspended body, all the more care is needed in the examination. Casper[2] relates an instructive case of this kind. A sailor was killed by a stab in the heart in a brothel in Amsterdam. The women washed the body of the blood, put a clean shirt on it, and suspended it by the neck. On examination of the body, the presence of the above wound coupled with the absence of the signs of asphyxia, showed without difficulty the true state of affairs. Had a careless examination been made, however, it is not impossible to conceive how this act of homicide might have been mistaken for one of suicide.

Assuming that it has been ascertained that death was caused by suspension, the next query to engage the attention of the examiner—and to answer as far as he can—is, Was the suspension or strangulation suicidal, accidental, or homicidal?

It is a statistical fact that death by suspension is a favourite mode of suicide. Reference to the Registrar-General's returns for 1886 to 1895 shows that, in England and Wales, out of a total of 6780 persons who died by hanging, 6771 were from suicide; and it is a well-ascertained fact that, taken over the three kingdoms, more men than women choose this form of suicide. There is, therefore, in the large percentage of cases, a strong presumption of suicide. Formerly it used to be taught that if, in such cases, part of the body of the victim rested upon the floor or ground, the case was more likely to be one of homicide than of suicide; but that doctrine has long since been rightly pronounced erroneous, for in many cases of undoubted suicide,—we would go the length of saying in the bulk of cases,—more or less of the bodies of the victims is found so resting. The writings of Tardieu, Ogston, Casper, and others abundantly show this. Our experience is that in every single case falling within our observation, some portion of the body was found resting. The amount of the body so resting may vary in extent from the major portion of the trunk downwards to merely the tips of the toes. In one of our cases the point at which the rope was attached was but three feet from the ground, and the lower part of the body from the hips downwards was resting on the floor. In another, the legs from the knees downwards were resting. Grant records the case of a man who sus-

[1] *The Lancet*, vol. ii. 1889, p. 451. [2] *Op. cit.* vol. ii. p. 191.

pended himself from the handle of a door two feet nine inches from the floor, and who was found dead in the sitting posture.[1] Suicides occasionally adopt novel methods. In one case, a woman laid herself on a bed, attached the running noose of a rope round her neck, tied the other end of the rope to a heavy piece of metal which she heaved over the iron-bar of the bed-frame, and was thus strangled.

The question becomes more complicated, however, when upon the body of the suspended person wounds produced by blunt or sharp weapons are found. It must be borne in mind that a determined suicide, failing to achieve his purpose by another method, may resort ultimately to suspension. This is well illustrated by a case which occurred in Duke Street Prison, Glasgow, where this mode of suicide was unquestionable. This man first tried to suspend himself but the ligature broke; he next tried to smash his skull by butting his head against the walls of his cell, by which he produced considerable wounds; again he tried to suspend himself from the ceiling by means of a bed-sheet which he affixed to a strap round his neck. When the cell-door was opened later, he was found suspended, and dead. It is not unknown, moreover, for a suicide to attempt suicide first by cutting his throat, and failing to produce the effect desired, to suspend himself. Ogston relates a case[2] where a man first cut his throat with a razor, from which he lost much blood, after which he went into an outhouse and hanged himself. It sometimes happens, too, that the attendant circumstances, apart from the mere suspension, indicate suicidal action prompted by insanity; for example, in 1896, a man employed in an electric engineering work in Glasgow, hanged himself from the hook of a spring-balance weighing machine, after fantastically clothing himself in a lady's chemise and white-frilled drawers, over the former being a pair of corsets—having previously divested himself of his male attire. He had arranged a small mirror so as to see himself suspended.

Accidental hanging, although of comparatively rare occurrence, is by no means unknown. A case is recorded from Middlesbro' in which a lad went into a cowshed to play. There was a swing attached to a beam which extended across the upper part of the shed. He had climbed up to this beam with the intention of sliding down one of the ropes of the swing, but in his descent a woollen cravat which he wore round his neck caught a large nail fastened in the beam, and he became suspended. Fortunately his father, requiring him, on going to look for him found him in this position, and cut him down. When rescued, he was black in the face and unconscious, but on application of restorative measures he was resuscitated. In another case which occurred near Preston, a boy had mounted an apple-tree for some fruit; he slipped between the branches, and his jacket, which was buttoned at the neck, turned up round his neck and strangled him. When found he was dead.

We have seen three curious cases of accidental strangulation. In the first, the body of the victim was found lying on top of a partially overturned, open-

[1] *The Lancet*, vol. ii. 1889, p. 265.

[2] *Op. cit.* p. 532.

backed, "form," the larynx caught by the edge of the rail; in the second, the neck of the old man was found resting on the edge of the iron framework of a bed; and in the third, the constriction of the throat was due to the strap network of a sofa-bottom through a gap in which the head had passed. In all of these cases, circumstances pointed to the victims being in a state of helplessness either from intoxication, a fit, or from feeble old age.

At the Dublin Assizes in 1892, a case—R. *v.* Montague—of accidental hanging involving culpability of the mother, occurred under somewhat remarkable circumstances. The mother was charged with the crime of manslaughter. From the evidence it appeared that in order to punish her child—a girl of three years—she tied the child's arms above the elbows with a stocking, which she then passed round the body. To the stocking behind she attached one end of a cord, and fastened the other to a ring in the wall of a dark closet about 5½ feet from the floor, and about 2½ feet above the girl's head. At the end of three hours, which was the term of punishment, the mother went to let the child out, but she found that her child was dead, having been suspended by the cord. It is difficult to account precisely for the cause of the suspension, but in any case, a mark was found on the child's neck at the lower part of the trachea. The mother was found guilty and sentenced to one year's imprisonment.

Homicidal Hanging.—From the difficulties attendant upon the successful accomplishment of this act, the crime is comparatively rare. "Lynching" is the modern method of its accomplishment, but this is fortunately confined to America. The victim is taken from the prison and hanged by the mob who take him therefrom. This proceeding is contrary to the law, and where the ringleaders are known, they may be punished; usually, however, the crime is winked at by the authorities. Except in cases of helplessness from age or from any other enfeebling cause, it may be considered that the act could not be perpetrated by one assailant. Usually, therefore, more than one is involved in its commission. One of the sensational crimes of Paris was perpetrated in this manner in 1888,[1] in the murder of a man named Gouffé. The culprits were a girl named Bompard who had formed an illicit acquaintance with the victim, and a man named Eyraud. The former had an interview with the victim in her room, where the arrangements for effecting the murder had been previously arranged. In an alcove in the room, the background of which was a curtain, was a sofa, on which the victim, with the girl Bompard on his knee, was seated. She playfully passed a silken noose round the neck of her lover; the accomplice Eyraud was meanwhile secreted behind the curtain. In the roof of the alcove, a compound pulley had been fixed, which was hidden by the curtain. When the girl passed the loop round the victim's neck, she adroitly passed the free end, on which was a loop, to her accomplice behind the curtain, who immediately attached the loop over a hook at the end of the rope suspended from the pulley, and, at once, by pulling on the rope with the aid of the pulley, suspended the victim. After the death was effected, both of them proceeded to rob the body of its valuables; thereafter, they put it into a box, conveyed the box to some distance from the scene of the crime and left it there. On the body being discovered fourteen days later and an examination made of it, it was found that the hyoid bone was fractured. Links in the evidence pointed to the guilty knowledge of Eyraud and Bompard of the crime, whereupon they were arrested. Later, the female prisoner confessed to the commission of the deed, and narrated the mode, as detailed above, in which it had been accomplished.

Many instances are recorded, too, of multiple suspensions by parents of their children; and Ogston[2] relates one case of a woman who was tried in Edinburgh in 1827 for hanging her husband, which she effected by passing a noose round his neck while he was asleep, and pulling him up.

In all of these cases, suspicion ought at once to be aroused if, upon the body, are found such severe lesions of the neck as could not be accounted for by the position of the body and its relation to surrounding objects. From the narration of the above cases, the absence of injuries from resistance on the part of the victims is easily accounted for by the fact that they were taken unawares; in other cases, where resistance was possible, marks of violence would likely be

[1] Lacassagne—*Archives de l'Anthropologie Criminelle*, 1890.
[2] *Op. cit.* p. 532.

found. There are additional reasons why homicidal suspension is comparatively rare, and among these is the greater ease of accomplishment, comparatively speaking, of strangulation, or, under certain circumstances, of throttling. In the Rainhill tragedy, 1892, one of the five victims was murdered by strangulation in the following way: a pillow-slip had been passed over the head, and was tied round the neck by a piece of rope which was passed twice round the neck and tied in a double knot in front. Next to the skin of the neck was found a second piece of rope which tightly encircled the neck, producing deep indentation of the tissues. At the Circuit Court, Dundee, April 1889, a man was sentenced to death for murdering his wife by strangulation. From the medical evidence, it appeared that she had been stunned by a blow on the temple, then strangled, and that her body was cut up after death. There was a mark of only one ligature on the neck, varying in width from one-eighth to one-third of an inch, which indicated that the direction of the constricting force was downwards, outwards, and backwards,—a direction impossible for a right-handed person, as the deceased was.[1] Throttling is always homicidal, as it is difficult to conceive a suicide clutching his own throat for sufficient time to produce death, since the onset of unconsciousness would cause the clutching hand to be relaxed. At the same time it is difficult to exhaust the ingenuity of the suicide in the device of novel plans to effect his purpose. In very many cases where the question of suicide, accident, or homicide is raised with reference to such forms of death, the actual proof, it must be remembered, may fall to be determined as much, indeed, if not more, by the moral evidence and the local circumstances, than by the evidence afforded the medical jurist from the examination of the body.

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[1] *The Lancet*, vol. i. 1889, p. 696.

CHAPTER VIII.

MEDICO-LEGAL FORMS OF DEATH (*continued*).

IV. DEATH BY LIGHTNING AND ELECTRICITY.

In ancient times, the bodies of those who were struck by Lightning were either buried on the spot where they were killed, or were permitted to decompose in the place where the stroke fell upon them. These places were fenced around, lest any one should unawares contract pollution from them, as it was believed by the ancients that those who were lightning-struck had incurred the anger of Jupiter. Hence these places were to be avoided on the principle that the gods chastened those with whom they were angry, and the places, therefore, were sacred to the deity. So the Romans called such ground *bidental*, or forked—possibly from the physical appearance of the lightning-flash. In Great Britain the number of deaths annually varies between twenty and forty—depending upon the prevalence of thunderstorms.

The medical jurist is only consulted in respect of those bodies found in public or private places which bear the marks of injury of which lightning may be the probable cause, in contradistinction to other forms of violent death, or to certify or give evidence concerning those cases the cause of which is obvious.

Deaths by Lightning occur chiefly in the spring and summer in the temperate zones and in the hot season in the torrid zone. Generally speaking, the human body is a bad conductor of electricity. According to Ranke, the conducting-power of muscle for the electric current is three million times weaker than mercury, and fifteen million times weaker than copper, while nerve tissue, on the other hand, conducts the current almost as well as a rod of metal. This last-mentioned fact accounts for the proximate cause of death by lightning-stroke, viz. : concussion, or shock through the nervous system.

Before discussing the appearances and post-mortem signs on bodies struck by the electric fluid, it will be well to consider some typical cases of Lightning-stroke. The following may be taken as illustrative. The facts first to be narrated are a resumé of those of a case the full description of which was given to the Clinical Society of London in Nov. 1879.[1]

1. A farm-labourer, taking refuge during a thunderstorm under a willow tree close to a shed in which three of his companions had taken shelter, was struck by the lightning. The course of the lightning was to go in by the door of the shed and out by the window—which it carried before it, depositing it in the field

[1] *The Lancet*, vol. ii. 1879, p. 655.

adjacent. The occupants of the shed were not hurt—only scared,—and when the storm had somewhat passed over they went out to look for their companion. They found the tree, under whose branches they had left him, denuded of its bark, and their companion's boots standing at its foot. The man himself was lying on his back a couple of yards off, and though he was fully clothed when he was last seen by them, he was now naked, and nothing of his apparel was left on his person except the left arm of his flannel vest. He was conscious. His body, however, was marked by burning, and it was found that his leg was broken. The field around was strewn with fragments of clothing. His watch had a hole burnt in the case, and the chain was almost entirely destroyed. The man stated that he was struck violently on the chest and shoulders, became enveloped in blinding light, and was hurled into the air, coming down on his back "all of a crash," but never losing consciousness. Three hours later he was seen by Dr. Wilks—who describes the facts. He was then quiet and composed, but complained of some pain in each leg, and of a general sense of burning, fiery heat. He was deaf. The hair of his face was burned, and his body was covered with marks of burning, superficial on the chest, but deeper on the abdomen and right thigh. Down each thigh and leg was a broad indurated band of burning which passed along

FIG. 33.—Effects upon Clothes of Men struck by Lightning at Hampstead Heath on June 14, 1888. (*By permission of the Royal Meteorological Society.*)

the inner side of the knee and ended below at the left inner ankle and at the right heel respectively. On the left foot was a lacerated wound with a comminuted fracture of the *os calcis*. The bones of the right leg had sustained a compound fracture, and the tibia protruded through the skin in the course of the burn. The man eventually made a good recovery.

2. At Kilmalcolm, near Paisley, in May 1899, two men working at a building were struck down unconscious, part of their clothing was destroyed, and one of them sustained severe burns on the right arm and hand.

3. In June 1888, two men working on a farm near Hampstead Heath, while busily engaged at their out-door dinner meal, were struck. One was knocked senseless, the other was only momentarily stunned. The latter, on recovering consciousness, discovered that his trousers were on fire, that the knife with which he had been cutting his food had been knocked for some distance out of his hand, and that the steel buckles had been torn from his trousers. The former was burned on the right side from shoulder to foot. (Fig. 33.)

4. A workman who was killed by lightning on the highway on his way to work, sustained the following injuries, viz.: his lower lip was cut to the extent of an

inch, the tip of his nose was denuded of skin, the hair of the left side of his body, beginning with the left eyebrow, was slightly singed, but his clothes bore no marks of singeing.[1]

5. A farmer who had gone out of his house to look after some cattle, was struck about thirty yards from his house where he was found dead lying on his face, with his right hand in his trousers pocket. His felt hat was torn to pieces, and both cloth leggings were torn almost from top to bottom. At the upper anterior angle of the left parietal bone was a wound about the size of a penny, extending to the bone, and from it was a red line of burning, about a quarter of an inch in breadth, which ran down the neck and over the middle of the clavicle to the epigastrium. The trunk of the body, the thighs, and legs were also burned. On

FIG. 34.—Effects upon Boots of Choristers struck by Lightning at Atcham Church, Shrewsbury. (*By permission of Mr. J. Laing, Shrewsbury.*)

the under surface of the left foot was a wound of the size of a threepenny piece, and on the left groin were two vesicles about the size of a man's thumb. The hair of the scalp, neck, and body was burnt and singed, in the neighbourhood of the bands of burning. The blood was abnormally fluid. The face was livid.[2]

6. In another case, a farmer near Airdrie who was driving a horse and cart was seen by two servants to be struck by lightning. The horse and cart were both knocked over, and were found lying on their sides, the animal, however, being quite uninjured. The farmer was dead. His necktie and whiskers were burned.

7. Dr. Dunscombe-Honiball gives an account of lightning-stroke in British Guiana[3] where such occurrences are very common. He tells of a party of male

[1] *B. M. J.*, vol. ii. (Oct. 1). 1898. [2] Ibid., vol. i. 1897, p. 1178.
[3] Ibid., vol. i. (May 12), 1900.

East Indians, numbering fifteen, who had taken shelter in a small hut, and out of that number two were killed outright, two were rendered completely insensible, and six suffered in varying degrees from shock. Of the two men killed, one had a compound fracture of the right temporal bone, the fracture extending into the middle fossa of the skull through the petrous portion of the temporal bone and tearing the brain membranes. There was scorching of the whole front of the chest, abdomen, and thighs, the chest marks being of a distinctively arborescent appearance; the other had only sustained abrasions of the left side of the chest over the cardiac region accompanied by scorching, and an abrasion below the right knee. Here cords another case which illustrates a point not yet observed in any of the foregoing cases, viz.: the magnetisation of metallic articles after lightning-stroke. This man was walking along with two of his fellow-workmen carrying a four-pronged agricultural fork over his right shoulder, with a saucepan slung on its handle. He was instantaneously killed by the lightning flash. His hat was torn to ribbons, and the fragments thrown yards away; the tin saucepan was smashed in, and one of the prongs of the fork was found to be magnetic. He had sustained a compound fracture of the skull.

FIG. 35.—Arborescent Markings on Arm of Boy struck by Lightning. The photograph was taken four hours after the accident. In eleven hours after the accident the markings had entirely disappeared.

8. Only one more case need be recorded in order to exemplify other markings on the body, viz.: the arborescent marks of burning. Dr. Yule Mackay[1] records a case, illustrated by a photograph, of a boy who, with three companions, took refuge in an empty stable during a thunderstorm. The stable was surrounded by lime trees which formed an awning over it. The four boys were standing in the doorway, three in front and one behind, the boy in question being one of the front row. The four boys were struck, but the three in the front row were marked by the arborescent prints on the arms, chest, or legs, while the boy who was standing behind was only marked on his face and neck. Three of them were partially stunned, and the fourth was rendered completely unconscious. The boy in question was thrown violently to the ground by the stroke and was severely hurt about the face and forehead. The arms were paralysed temporarily; indeed for some time after he regained consciousness he was unable to remove his hands from his pockets, where he had placed them before the accident. After he got home, by reason of his complaint of the burning heat in his arms, his clothing

[1] *Glasgow Medical Journal*, vol. xx. p. 321, *et seq.*

was removed, and arborescent markings were found extending from the left elbow to the shoulder and radiating across the left chest. The marks were of a ramified, tree-like form, not unlike that of a yew, or the fronds of a fern. Four hours after the accident, the marks were bright enough to be photographed, but four and a half hours later they were hardly visible. There was no vesication or shedding of the skin afterwards. The clothes were uninjured, and a knife and buttons which the boy had about his person were not affected in any way. A metal water-pipe or roof-gutter on the stable was curled up by the same stroke, and the leaves of the lime trees which overhung the doorway were perforated like leaves eaten by caterpillars. (Fig. 35.)

Of the lesions found after lightning-stroke those known as lightning prints are probably the most interesting. They were first described, we believe, by Andreas Poey, of Havana, in 1861, in a pamphlet which contains the record of a large number of cases, many of which appear, however, to be exaggerated as to their particulars. Stricker,[1] Rindfleisch,[2] and others[3] have also recorded

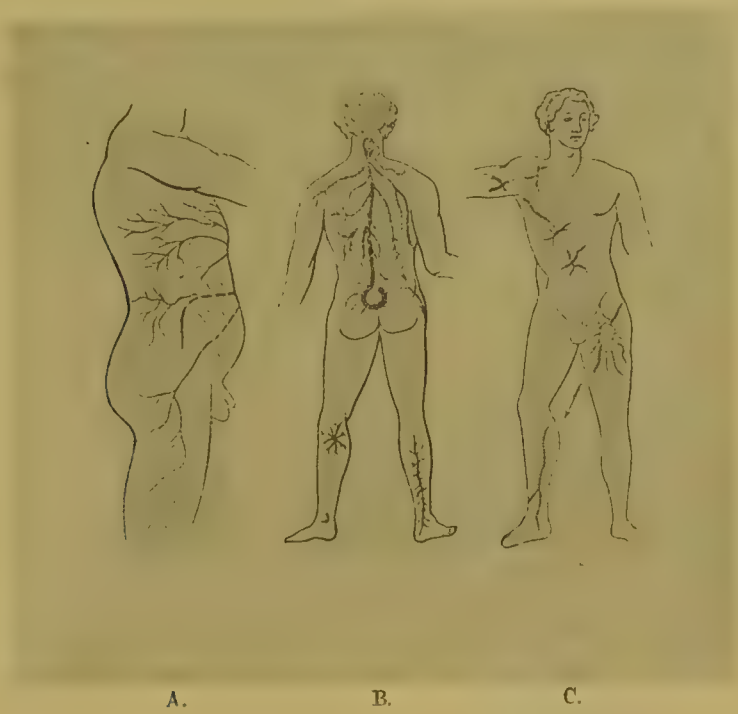

FIG. 36.—Arborescent Markings after Lightning-Stroke.
A, from Rindfleisch; B and C, from Stricker.

examples of such prints. These prints, or markings, have been compared by Pfaffe of Stuttgart to Lichtenberg's figures, which are produced when a charge of positive electricity from a Leyden jar is passed through a needle to the surface of a glass plate which has been dusted over with the powder of lycopodium. Various theories have been put forward to account for their causation, but they are believed to be due to coagulation of the blood in the minute capillaries of the skin from the electric fluid. (Fig. 36.)

The lesions which may be met with after Lightning-stroke may, therefore, be summed up as follows: 1. Wounds of almost any description; 2. Fractures, simple, compound, comminuted, single or multiple; 3. Burns of almost any shape, linear, streaks, patches, or

[1] Virchow's *Archiv.*, vol. xx. and vol. xxviii. [2] Idem, vol. xxv.
[3] Casper's *Vierteljahrsschrift*, 1863; *Australian Medical Journal*, 1870; *B. M. J.*, vol. i. 1876, p. 102 (Jefferies); *Lancet*, vol. ii. 1878, p. 187 (Waugh).

arborescent-like; 4. Ecchymoses; 5. Singeing of the hair of scalp, face, or body; 6. Impressions of metallic articles on skin.

In addition to the lesions illustrated in the foregoing cases there are certain subjective conditions which result from this accident, such as blindness, deafness, paralysis, loss of memory, delirium, and convulsions.

A very marked sign is the magnetisation of metallic articles found on the person, or of articles which were being carried by the individual when struck.

The proximate cause of death by Lightning is neuro-paralysis or shock. The post-mortem signs, therefore, are in many cases remarkably negative. At the same time, observers who have seen many cases of death by this agency affirm that in every case some indicative lesion will be found. In most of the cases one or more lesions of the kinds enumerated above is likely to be found, and in all cases where a combination of wounding with burning is found under circumstances in which lightning-stroke is a tenable hypothesis, careful examination of the electric state of metallic articles on the body should be made.

The dictum of the celebrated John Hunter, that in deaths by lightning there is an absence of *rigor mortis*, must now be held to be disproved. Dr. Dunscombe-Honiball has placed this question beyond doubt. Of the cases already described from his record, in the first, *rigor mortis* was markedly present twenty hours after death, in the second, it was also present, and in the third, it was present eight hours after the death. The statement that the blood is abnormally fluid must also be traversed. The cavities of the heart are usually empty, or those of one side may contain a little blood. Dr. Honiball tenders this caution, which we repeat as a wise caution: Be not too sure that in every body found dead after a thunderstorm, and where no marks upon it are found, that death was due to lightning-stroke, for it may happen that death was due solely to cardiac syncope owing to sudden and startling fright. This advice is wholesome, because there are not a few people who are preternaturally afraid of a thunderstorm.

Death by Electricity.—It is usually taught and believed that the cause of death by Lightning and of that by static electricity is identical, and that the differences between the one and the other are only differences of degree. That the electric fluid is a potent factor in both goes without saying, but as one writer forcibly puts it[1]: Has an electric shock ever amputated a man's fingers, or fractured a skull (quite apart from the possibility of these lesions having been produced by any mechanical cause)? That there are other factors in the production of the lesions of lightning-stroke seems apparent, but it is difficult to state what they are. When Woodman and Tidy published in 1877 their work on Forensic medicine, deaths by electricity were almost prophetically predicted in the following words: "Now that galvanic batteries are becoming common in scientific institutions and private laboratories, it is by no means unlikely that some deaths (accidental or otherwise) may happen from the

[1] *B. M. J.*, vol. i. (May 12), 1900.

sudden discharge passing through the human body." These words would have been still more prophetic if, at that date, it could have been foreseen that this agency was so soon thereafter to be harnessed and utilised in installations for heating, lighting, and motor purposes, and, further, as a mode of judicial homicide. These have all been realised since that date. The experiments conducted by the late Sir Benjamin Ward Richardson and Dr. Sedgwick in our own country, and by Nothnagel in Germany, as to the effects produced upon the bodies of the lower animals by the passage through them of electrical discharges, are well worthy of study. The former worked with the electrical apparatus of the Polytechnic Institution, London, which is of enormous proportions and capable of discharging miniature flashes of lightning. From that apparatus, they were able to obtain three different sparks or discharges depending upon the correlation of the component parts of the apparatus; the first discharge, obtained from the secondary wire charged from the primary, measured twenty-nine inches in length; the second, when the break was used, measured from ten to fifteen inches, was blue in colour, forked, and continuous in character; and the third, when a huge Leyden jar was charged from the coil by three discharges, was of a dangerous character. The lethal effect of these discharges differed; the first did little harm to the animals, the second caused powerful tetanic contractions of the muscles, and the third was usually fatal. Nothnagel's experiments[1] were partly repetitive of these, and partly broke fresh ground. The animals experimented upon were rabbits, the electrodes being placed underneath the skin on account of the fur and skin dispersing the electric current. His experiments were intended to discover the results which would follow the passing of an electric discharge through the animal's body, the electrodes being placed at different points of the body. When one electrode was placed beneath the claws of a hind foot and the other below the skin of the groin, complete anæsthesia of the foot was produced after the discharge was passed, and irrespective of the direction of the flow of the current; the same phenomenon being seen with the fore limb and axilla. When one electrode was placed under the claws of a fore limb and the other under the skin of the tail, anæsthesia of both foot and tail was produced, presumably due to the greater intensity of the discharge at the points of entrance and exit. Long before this time, Arago, from his experiments on magnetism and electricity, expressed the opinion that when lightning struck men or animals placed near one another, either in a straight line or in an open curve, the action of the stroke would be always most severe at the extremities of the line or series. This has been amply demonstrated from time to time; for although all of a series may be struck down, only those at the extremities are likely to be killed. In one instance thirty-two cows standing in a row in a cowshed were struck by lightning, thirty were knocked down by the stroke, but only the cow at each extremity of the series died. In another case, five children were seated on a form in school when they were struck by lightning; the first and last were killed, while the others were merely shaken, and quickly recovered. It would seem, therefore, that there is some

[1] *The Lancet*, vol. i. 1880, p. 863.

parallelism between the effects of electrical discharges at the contact points on the body of an animal and the effects of lightning-stroke upon a series of human beings or animals in line.

The following cases may be taken as typical of the fatal effects of electricity :—

1. A labourer, aged 22, was killed by coming in contact with the wires which conveyed electricity from a dynamo to the mansion of Hatfield. The power used for generating the electricity for 117 lamps of the Brush system was an engine of 16-horse power, which was situated in a sawmill behind the mansion. From this place, the wires ran along the garden-wall about three feet from the ground, and were neither insulated nor protected. This man was at work near this point hanging a telephone wire, and had been sent to ease the wires at the corner of a wall to prevent them being cut. Immediately thereafter the wires were heard to shake, and the man was seen to fall. On his fellow-workmen running up to him, he was found dead. It was supposed that he had stumbled, and, trying to prevent the fall, had grasped the electric wire in his hands. At the time, his hands and clothes were dripping with rain, the day being very wet. There were no lesions to be seen upon the body, and the medical evidence at the inquest showed that death was caused by violent shock to brain and nervous system and paralysis of the heart.[1]

2. At the Health Exhibition in London, a man was killed while at work in the dynamo shed. It was shown in evidence at the inquest that the deceased was observed to put his hands on the machine, whereupon he was seen to be convulsively held to the machine, then to fall back. When picked up, he was dead. The only external lesion found upon the body was that of a slight burn between the forefinger and thumb of the left hand.

3. Of more recent cases, probably those connected with electrical apparatus, such as the breaking of a telephone wire and its contact with the electric wire for working the tramway at Liverpool, are the most instructive, since they further illustrate some points not clearly indicated in those preceding. On 11th February, 1901, a telephone wire snapped over the top of an electric wire which supplies the motor power of the tramway line in London Road, Liverpool. The broken wire came in contact with the electric wire and fell down among the outside passengers of a passing tramcar. The wire having encircled the leg of one man caused his instantaneous death ; a second man was also killed by the shock, and fourteen other passengers were also affected, sustaining injuries which necessitated their removal to the Infirmary. The clothes of one of the persons caught fire and blazed. On examination of the patients at the Infirmary, nearly all were found suffering from shock, and a few were burned. The marks of burning were of a greenish colour caused by the fusing and volatilisation of the copper wire. In one of the fatal cases, marks resembling burning were visible on the bare forehead, and in the case of another, there were marks on five parts of the body which were covered by clothing. On the abdomen was a white slough about the size of half-a-crown, surrounded by blisters, and a like condition on one thigh. Blisters were also present on both legs and on the toes of one foot. What is somewhat remarkable, is the fact that though the marks had the physical appearance of burns, the clothing over the marks bore no evidence of burning or singeing. The electric wires of the tramway system are kept at a pressure of 500 volts.

4. Mr. Smurthwaite[2] gives an interesting account, with illustrations, of the case of a man who sustained injuries from an electrical discharge. The man when admitted to the Southport Infirmary on 12th Feb. 1898, was in a semi-unconscious condition, and was suffering from severe burns of the right hand and thigh. (Figs. 37 and 38.) He was employed in the local electric works. His injuries were caused by his having come in contact with a switch. The man, who had at the time a large bunch of keys in his right trousers' pocket, was leaning with his right thigh against an unprotected brass fitting in the act of adjusting the brushes on the motor with his right hand, when he felt the shock. A circuit was evidently completed through the agency of the bunch of keys,

[1] *B. M. J.*, vol. ii. 1881, p. 1027. [2] Ibid., vol. i. 1901, p. 573.

FIG. 37.—Electric Burn of Right Hand—36 hours after accident—from contact with electric machinery passing 2150 volts. This illustration was kindly lent to the author by Dr. Baildon, Senior Surgeon, Southport Infirmary. *Vide* account of the case by Mr. H. Smurthwaite, M.B., etc.

FIG. 38.—Electric Burn of Right Hand. Another view of Fig. 37.

because a large hole was burnt in his trousers over the seat of the pocket in which they were, and the adjacent part of his thigh was charred. The keys themselves had the appearance as if they had just been taken out of a hot furnace. A fellow-workman who heard him shout at the moment of the shock, on running up to him, found him fixed to the machine in a condition of tetanic spasm, and his back bent in the position of opisthotonos. On being knocked off the machine by his fellow-workman, he lay on the ground as if dead for about ten minutes, when he slightly moved his eyelids, but could not speak. The burn on his thigh was of peculiar shape; about the centre of the burn or wound there were a number of depressions which evidently corresponded to the heads of the keys, and for about two inches round about this burn, the skin was very much swollen and of a dusky-red colour. This wound sloughed so much, later, that the muscles of the thigh were exposed. (Fig. 39.) The burns on the hand and fingers were very severe. On the second day, the first phalanx of the thumb and the first finger at the metatarso-phalangeal joint had to be amputated. He eventually recovered. The points of interest in this case are the following: (1) The accidental completion of the circuit by the keys in the man's pocket through the body to the hand which grasped the machine; (2) the large amount or high pressure of the electric current, 2150 volts, which passed through the body without fatal issue; and (3) the formation of severe burn-lesions at the points of contact.

FIG. 39.—Electric Burn of Right Thigh. (*Vide* Figs. 37, 38.) This lesion was caused by the presence in the trousers pocket of the man of a bulky bunch of keys which completed the electric circuit through his body, his right hand being in contact with another part of the electrical apparatus. Over the seat of this burn a hole was burned in the trousers. The keys looked as if they had just been taken out of a hot furnace. The burn had the appearance about its centre of depressions corresponding to the heads of the keys, and looked as if a red-hot poker had been repeatedly thrust into the thigh. Around the burn the skin was much swollen and of a dusky-red colour.

5. In the Court of Session, November, 1901, an action was tried by a linesman against a firm of electrical engineers for damages in respect of personal injuries sustained by the pursuer. It was alleged that while pursuer was about to fasten a guard wire to a pole, the platform rail of the tower upon which he was standing swung from under him forcing him to cling to the spare wire which proved to be "live,"—being charged, it was alleged, with 700 volts of electricity,—from which he was badly burned. A fellow-workman, seeing his peril, knocked him off the wire, else he might have been killed.

6. A man was admitted to the Glasgow Royal Infirmary on November 19th, 1901, in an unconscious condition, his arms and head being severely burned.

Carpo

The man was employed in the Corporation Electric Works, and accidentally fell on the "bus bars" connected with the switchboard. The switchboard has a voltage of 6500 volts. The bus bars are made of copper and convey the electric current from the switchboard to the cubicles, by means of which the electric current is distributed to different districts of the city. The bus bars are three in number and are two feet apart. The following burns were found upon the body, viz.: (1) On Right Arm: (*a*) a burn of 6th degree running from lower ends of radius and ulna on dorsal surface to lower ends of three outer metacarpal bones; (*b*) a burn of 5th degree all round forearm from wrist to four inches up the forearm; and (*c*) a burn of 5th degree in front of elbow-joint; (2) On Left Arm: (*a*) a burn of 6th degree over whole of palm of hand and palmar surfaces of fingers and thumb; (*b*) a burn of 5th degree along the whole anterior aspect of forearm and in front of elbow-joint; (*c*) a burn of 3rd degree extending for 3½ inches from wrist up the back of forearm; and (*d*), a patch of burning of 2nd degree under left axilla. On the head, the following burn was found: an area of burning of 6th degree above and behind the left ear, measuring 4½ inches by 3½ inches. The muscles of both arms were very strongly contracted. The breathing was of the Cheyne-Stokes type. He died eight hours after admission, having been unconscious all the time.

The question has arisen whether the lesions of apparent burning seen on the body after electric discharges are identical in every particular with those of burning by fire. The observation in the Liverpool cases that such marks were found on the body where no corresponding marks were found on the superjacent clothing would lead to the opinion that the cause was not, at least, direct contact with an incandescent body. Mally [1] has made a clinical and experimental study of these lesions, and he states that they may be caused when the body, or a part of it, either comes between two conductors or between a single conductor and the earth. The former point is well illustrated by the Southport case, the latter by the Liverpool cases. But he affirms that there are absolute differences between so-called electric burns and ordinary burns, which are mainly as follows: the former are painless, dry, and aseptic, are usually more or less rounded in shape, and reaction in the surrounding tissues is slow in supervening. He says that these characters are due to such conditions as the following: very high elevation of temperature, a feeble amount of heat, and a short period of action.

Electrocution.—This is now an established method in America of inflicting the last penalty of the law. In 1888, the Legislature of the State of New York passed a statute, based upon the report of a State Commission, whereby it was enacted that the above method of judicial homicide should be substituted for hanging. The Statute came into operation in the beginning of the following year. The method has received the above somewhat inelegant title.

The following is the manner in which the death-sentence is carried out, and the mechanism employed for the purpose. The apparatus consists of a stout chair with an inclined back, which is securely fastened to the floor or ground with bolts. To the chair are riveted two strong leather bands, which are put in such a position that one can be fastened across the chest, and the other, over the head of the criminal. The chair itself is connected with the electric current by means of two carefully insulated conductors with the pole-switch by which the electric current is conveyed to the body of the victim. These conductors are brought into contact with the body of the criminal at two points, viz.: with the crown of the head, by means of a curved copper rod ending in a knob covered by felt, which is kept pressed forward and downwards by means of a spiral spring, and at the nape of the neck, by means of a metal plate covered by felt, which is kept in position by a rubber or leather collar which is put round the neck. The felt at the extremities of the conductors, when the apparatus is to be used, is saturated with a solution of zinc sulphate, or ammonium chloride. When execution is to be performed, the condemned man is placed in the chair, the straps are adjusted, and the conductors placed in position, and, after a veil

[1] *Rev. de Chir.*, March, 1900.

is placed over the face, the current is turned on. Since the institution of this method, however, the position of the second conductor or electrode has been changed from the nape of the neck to the outer side of the right leg, at the junction of the upper and middle third. In order to make certain that death has taken place the current is passed three times through the body, with a short interval between.

Dr. Joseph O'Neill[1] gives a description of the execution of a man in Sing-Sing Prison. After the current had been passed through the body once, "there was a blowing sound like the neigh of a horse, saliva came from the now open mouth, and the carotid artery began to pulsate." The discharge was repeated and kept up for 30 seconds, at the end of which time, examination by the phonendoscope revealed neither respiration nor cardiac pulsation. Cremasteric reflex was present, however, half-an-hour after death. Post-mortem lividity appeared very rapidly in the dependent parts. A necropsy was at once made of the body.

In March, 1899, a woman was similarly executed in the same prison. The first electric discharge killed her, but it was repeated a second time to make the fact absolutely positive. In such cases, according to Mr. Homer Bennett,[2] the only external signs found upon the body are slight blisters of the skin of the leg at the point of contact of one electrode.

If we may judge from the opinions of the medical press of the United States, medical opinion is divided respecting the rapidity, efficiency, and painlessness of this mode of execution. It may well be that the convulsive tetanic contortions of the muscles at the time of the discharge are interpreted erroneously as manifestations of consciousness instead of insensible muscular contractions, which they really are; and therefore, opposition to the method is offered. But a more cogent objection has been urged against its use, viz.: that the bodily resistance to electric discharges differs not only in different individuals but in the same individual at different times, and, hence, it is impossible to regulate the amount, or intensity of discharge required. To this, however, there is the ready rejoinder, that more than enough current under any given set of conditions may be employed. This leads us to the consideration of the question, What force of electric discharge is likely to prove fatal? For the purposes of electrocution, the current used is one produced by an alternating dynamo, with an electromotive force of 1700 to 2000 volts. The current strength is about 7½ ampères, and the number of alternations 16,000 per minute. According to Dr. O'Reilly,[3] in a recent case, a current of 8 ampères at 1760 volts was applied for 4 seconds, and then was reduced to 2 ampères at 200 volts, and kept up for 56 seconds. Of the several cases of death by electricity from accident which have been recorded in Great Britain and on the Continent, the large bulk of them has been due to contact with wires which conveyed the current to an installation for lighting purposes, or to contact with parts of a dynamo at work. In all of these, death was due to that part of the discharge which had been diverted from its usual channels into and through the body of the victim. It has been observed that certain wires carrying strong currents sometimes give off very slight shocks in certain cases, whereas others, with weaker currents, have proved fatal. For example, in the Southport case the voltage of the machine with which the man's body came in contact was 2160 volts, and it did not prove fatal; and in the Liverpool case the current was only of 500 volts, and yet it killed two persons. From the current used in electrocution one would have expected the Southport sufferer to have been killed. The factor which determines the likelihood of a fatal issue would, therefore, appear to depend upon the receptive state of the particular person at the time of receipt of the electric discharge as well as the intensity of the discharge.

The mode of determining the strength of any current is by Ohm's law: *the current is the equivalent of the electro-motive force in difference of potential divided by the resistance.* In electrical language, the practical unit of current is called an ampère, of electro-motive force or potential a volt, and of resistance an ohm. The electro-motive force dangerous to life is from 300 to 350 volts. It remains,

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[1] *Atlantic Medical Weekly*, Sept. 17, 1898; *B. M. J.*, vol. ii. 1898 (Oct. 15).
[2] *American X-Ray Journal*, June, 1900; *B. M. J.*, vol. ii. 1900, p. 177.
[3] *Engineering*, vol. lxix. p. 769.

therefore, to determine the resistance in ohms which the human body at any given time will offer to the passage of electricity through it. This has already been obtained, approximately, by experiment. The hands, when perfectly dry, offer a resistance of 30,000 ohms; when perspiring ordinarily, of about 10,000 ohms; and when dripping wet, of only 7,000 ohms. This last resistance will be more readily appreciated when it is stated that one of the Atlantic Cables offers a resistance of about 8000 ohms. If the resistance of the hands when perspiring ordinarily be taken as 10,000 ohms, and the smallest fatal electro-motive force as 300 volts, then according to Ohm's law: $C = \frac{E}{R}$, or $C = \frac{300}{10,000}$, which is equivalent to a unit divided by 33·333; therefore, when the potential is great enough to discharge a current of 1.33 ampère through the body, fatal results will follow. The difference of potential or electro-motive force differs, however, in the two principal systems of electric lighting, viz.: the incandescent and the arc. In the former, the difference in potential rarely exceeds 150 volts between any two points of the circuit outside of the lamps; consequently, neither at any of these points nor at the terminals of the dynamo is a fatal shock likely to follow contact. But it is very different in the latter system. The larger the number of lights in series on the circuit (and they are frequently so placed) the greater must be the electro-motive force required to produce the light, because of the greater sum of resistance offered by the carbons of each lamp. When, therefore, the terminal wires are caught in a circuit which includes eight lamps, the difference of electric potential becomes so great as to send a current through the body which is dangerous to life. It ought, further, to be remembered that the most severe effects of a discharge are perceived at the moments of opening or closing the circuit, or, in a closed circuit at the moment when a current at the vanishing point becomes re-established. It must be obvious, at the same time, that the effects indicated can only happen from naked, or imperfectly insulated parts of the machine or circuit; such, indeed, are impossible with perfectly insulated parts or wires. The Board of Trade Regulations forbid currents exceeding 250 volts to be introduced into dwelling-houses; hence, where domestic lighting is supplied from the electric mains, transforming apparatus to reduce the difference of potential, or as it is often called the pressure, must be interposed between the house-wires and the main supply.

V. DEATH BY BURNING AND SCALDING.

This is by no means an uncommon form of death; and the lesions found upon a body present a variety of appearances. Burns and Scalds may be produced in the following ways:—

1. By a very elevated temperature, the medium being either dry or moist; (*a*) by solid bodies in an incandescent condition; (*b*) by liquids near or at their boiling points; (*c*) by steam.
2. By Corrosives, solid or liquid.
3. By Friction.
4. By Lightning and Electricity.

A burn may be defined as a lesion which is caused by the application of heat or of chemical substances to the external or internal surfaces of the body, the effect of which is a more or less marked destruction of tissue. This definition, therefore, includes all lesions whether produced by fire, water, or by the combustion of tissues due to chemical action. A scald may be defined as a lesion which results from the application of a liquid at or near its boiling point, or from the gaseous form of a liquid—as steam. On a body which has been subjected to the influence of fire, the lesions found may be graduated from the simplest erythematous blush, up through the different surgical degrees of burning, to roasting and charring of a

greater or lesser portion of the body; whereas, on a body subjected to the application of scalding fluids or steam, the most marked effect is vesication, more or less widespread. But on bodies subjected to the action of corrosives, it will depend upon the kind of corrosive used what the lesions will be; for example, from the corrosive mineral acids and alkalies, vesication if not entirely unknown, is but rarely found; but where Greek fire—which is composed of phosphorus dissolved in carbon disulphide—has been used, vesication will probably be found, because when the CS_2 evaporates the phosphorus becomes oxidised by the oxygen of the air and is set aflame. The law, however, does not differentiate between the causes of lesions, and denominates them all by the general term of burns. As a general rule, all bodies which have been taken from a building which has been burned, or is afire, present some appearances of the effects of fire; but it must not be supposed, therefore, that all of these deaths have been due to the effects of fire. On the other hand, some persons may have died asphyxiated by the smoke; others may have died from shock, or the influence of terror; certain others, again, may have met their death from the results of injuries either from themselves having fallen from a height, or from débris falling upon them. In such cases, therefore, while the external appearances indicate the effects of burning, the internal appearances—where such can be discerned—may point to different proximate causes of death.

The medico-legal points which emerge for discussion are the following:—

1. Are the lesions found likely to have been produced by any of the fore-mentioned causes?
2. Were they produced during life, or after death?
3. Do they alone account for the death?

I. **Are the Lesions found due to Burning?**—The lesions and appearances found upon a body which are caused by fire may be summed up in the following:—

(*a*) Vesicles, more or less widespread;
(*b*) Roasted patches of skin, or of deeper parts of the body;
(*c*) Singeing or burning of the hair of the body and of the clothing;
(*d*) Deposits of carbonaceous material on the body.

Those caused by Scalding liquids are:—

(*a*) Inflammatory erythema of skin;
(*b*) Vesication.

Those caused by Corrosives:—

(*a*) Inflammatory redness of skin;
(*b*) Ulcerated patches of skin;
(*c*) Vesicles (where Greek fire has been used);
(*d*) Discoloration and staining of skin and clothing.

It is necessary, upon occasion, to establish the cause of the lesions from their character and from other appearances found on the body. The diagnosis, therefore, between burning by fire and by scalding may be established by the presence or absence upon the body of certain lesions. Wherever singeing of the hair or clothing, or of both, deposition on the skin or clothing of carbonaceous material, and charring of tissue are found, fire may be declared to be the cause. And if to

these is added vesication, the picture is complete. If vesication is extensively present and the others absent, it may be affirmed with accuracy that a boiling fluid, or steam, has been the cause. At the same time, it must be kept in mind that, in certain cases, vesication may be produced apart from the application of either a boiling liquid or steam, as, for example, where a portion of the body has been allowed to soak in a decomposing animal fluid, such as urine, and in a medium in which the heat consequent upon such fermentative action is prevented from quickly radiating. Even in these cases, however, heat is essentially the prime cause of the vesication. Such vesicles are, most usually, found under the following conditions, viz.: (*a*), where a patient is bed-ridden; (*b*), where there is neglect in the removal of discharges involuntarily passed; and (*c*), where the vital resistance of the tissues is lessened by disease. It was our duty upon one occasion, under such conditions as the foregoing, to report to the criminal authorities respecting the merits of a charge of mal-praxis made by one medical man against another of neglect of a patient, but the facts exonerated from blame the practitioner against whom the charge had been made.

The lesions found on a body where corrosives have been applied are characteristic of the particular corrosive applied. Corrosives differ in their intimate action upon the tissues; Sulphuric acid, for example, by the rapid abstraction of water from the tissues and the consequent rise of local temperature; Nitric Acid by the formation of new compounds, as Picric Acid; Nitrate of Silver, by hyperoxidation of tissue, and the formation of the albuminate of silver and the liberation of nitric acid; and Greek fire by direct combustion of the tissues from the rapid oxidation and burning of the phosphorus. The diagnosis of lesions by corrosives from those by fire or by a heated fluid or steam, may be established by the following points, viz. :—

(*a*) The absence of vesication;

(*b*) The presence of colour-stains on skin or clothing;

(*c*) By chemical analysis of the stains.

But marks of burning may be found upon a body and on the clothes which may not be caused by the application of fire as such, as the following case which we investigated will show.

A man employed in a saw-mill disappeared from his usual place during working hours. His prolonged absence caused a search to be instituted, but he could not be found within the works. The workmen employed in the neighbourhood of the shaft in which the driving-belt of the machinery revolved, had their attention attracted later by the odour of burning flesh and clothing, which they found to proceed from this shaft. On the machinery being stopped, the body of the missing man was found lying at the bottom of the shaft, between the wall of the shaft and the driving-belt. On examination of his body, marks of burning were found upon the body and on the clothing. There were other marks of violence on the body which indicated that in falling into the shaft he had met his death by being violently tossed up and down by the driving-belt. From the presence of vesication on the body, it was further evident that the burning was produced while he was still alive. There was no fire in that place, or in the near neighbourhood. The only conclusion which could be arrived at was that the friction of the driving-belt against his clothing and body had generated the heat which first set afire his cotton jacket, and later, produced the burning of the body. It was impossible to say whether or not the man was conscious when he fell into the shaft.

II. **Were the Lesions produced Before, or After, Death?**—This is a question to answer which demands careful and deliberate consideration, and the answer entirely depends upon the presence or absence of evidences of *vital reaction* in the lesions found. The presence of vesication, the character of the fluid, if any, which is contained in the vesicles, and the inflammatory changes in and around the vesicles, must determine the answer. If a vesicle present the following characteristics it may be safely concluded that vital reaction had occurred, viz.:—

(*a*) If it contain a fluid which is serous, and is proved to be such by the presence of albumen and chlorides;

(*b*) If there exist an inflammatory areola on the circumference of the vesicle;

(*c*) If the base or floor of the vesicle be inflamed, and the papillæ of the skin swollen and reddened;

(*d*) In the event of the vesicle being burst, if pus be present.

If this last fact be found it would indicate that the person had lived for at least 36 hours after the burning. On the other hand, it may with accuracy be affirmed that the vesicle was of post-mortem origin, if the following characteristics are present, viz.:—

(*a*) If the vesicle be limited in size, and its contents scanty;

(*b*) If it contain air, or a small quantity of non-albuminous fluid with no chlorides;

(*c*) If there be entire absence of inflammatory reaction.

But many times the question has arisen, Is vesication possible, or likely to be found after death of the person? The experiments of Christison [1] on this point are of considerable value. One of these was as follows: To the body of a young man, comatose from opium, he applied a red-hot iron; half-an-hour after his death, he re-applied the same hot iron in three different places. *Vesication resulted from all the trials; but it was only at the points of test made during life that a true vesicle containing albuminous fluid was found, those made after death containing only air.* Taylor records a case in which on the body of a man who had just been drowned and who had been put into too hot a bath, vesications containing *bloody serum* were formed. Certain other observers as Champouillon, Leuret, Wright of Birmingham, and Chambert,[2] are of opinion that vesication may be produced within some hours after death. Casper [3] also experimenting in the same direction, was forced to the conclusion that vesicles are not ordinarily produced after death, but if and when they are produced, they never contain serum, but only watery vapour. Devergie asserts that they cannot be produced even ten minutes after death. The keynote to the answer, however, is to be found in the existence or non-existence of molecular life in the tissues which remains for variably short periods after somatic death, and in the presence or absence of blood-circulation.

To sum up on this point: *It may safely be laid down that a vesicle which contains marked evidence of vital reaction, in the ways formerly*

[1] *Edinburgh Medical Journal*, April 1831.
[2] *Ann. d'Hyg.*, 1859, vol. i. p. 342.
[3] Vol. i. p. 301, *op. cit.*

indicated, has been produced during life; that a vesicle, limited in area and in contents, may be produced in certain cases during the existence of molecular life in the tissues; and that a vesicle which contains air or watery vapour, and which has no inflammatory signs of reaction, may be deemed of post-mortem origin.

III. **Do the Lesions found upon a Body sufficiently account for the Death?**—This question must be looked at from two different points of view; first, in relation to the burning as a means of cloaking the commission of some other form of crime, and second, in the absence of other causes, with respect to the area and extent of the burning and its pathological consequences. The former aspect will be dealt with later. In considering the latter, attention must be paid to the following points, which, moreover, can only be stated as general propositions, although they may have especial significance in particular cases:—

1. *The age and general health of the person burned—judged from the appearances of the body itself.*

As a general proposition, it may be affirmed that children succumb quickly to the primary effects of burning or scalding from *shock*, and to the secondary effects from inflammation of serous membranes, such as pleurisy, peritonitis, and meningitis, from perforating ulcer of the duodenum, and from absorption of septic matter. As we ascend the scale of age the more significant factor is:—

2. *The area or superficies of the body which is affected.*

It may be said as a general truth, that the danger to adult life from burning or scalding is in direct proportion to the extent of body-surface involved, rather than to the severity of the burn itself, if concentrated or limited in area. Dr. Smart of Haslar Hospital[1] accurately measured, in a series of cases of scalding, the superficies of integumentary surface involved, and, after eliminating other factors in the cases, came to the conclusion that when 350 square inches of body-surface were involved, life was placed in the greatest jeopardy; and although in individual cases recovery may result where a larger area was involved, that more usually, death was the inevitable sequel. Burns or scalds, therefore, although but comparatively superficial, which involve one-third, or one-half of the surface of the body must be reckoned as necessarily fatal. Many years ago, in connection with a disastrous boiler explosion which took place in the Glasgow Iron Works from which several deaths by scalding resulted, we were able to verify the above statement, as in every case in which one-third of the body-surface was involved death ensued.

IV. **Is there evidence of Lesions on the body, other than those due to Burning, which might alone account for the Death?**—This question will obviously arise where it is suspected that the agency of fire has been invoked to hide crime of another sort, and it will entirely depend upon the condition in which the body is left after exposure to the fire, whether an answer can be given. In any case, however, where human remains, so treated, are found in a private place where they had no right to be, *a priori* suspicion is at once established.

[1] *B. M. J.*, vol. ii. 1876 (September 23).

This has happened in certain notorious cases, among others that in which Dr. Parkman met his death (*vide ante*).

In a trial in Paris in 1885, a man was tried for the murder of a woman by poison. He had tried to dispose of her remains by burning. Certain facts pointed definitely to this, such as the odour of burning flesh from the house of the prisoner, which went on for days and nights, the emanation of thick black smoke which issued from the chimney of his stove—all of which happened during hot July weather—and the production at the trial of three phials, the first of which contained soot from the flue of the stove of the prisoner, the second, soot from a flue in which a carcase had been burned for comparison, and the third, arsenic which was extracted from the body of the prisoner's first wife. The prisoner was found guilty. Many other cases might be quoted, but the above are sufficiently illustrative of that category of cases in which but scanty remains of the body are left. Foderè narrates a case in which a murderer killed several victims with an axe, and afterwards set the house on fire. The medical man who first examined the bodies certified that the cause of death was burning. But in the meantime, another victim was found about 100 paces from the house, on whose body were marks of violence, and owing to the suspicion of foul play to which this fact gave rise, the other bodies were exhumed and re-examined, whereupon it was found that the marks of burning were only superficial,—not sufficiently deep, indeed, to obscure the marks of wounds from an axe.

Burning may, likewise, be caused by Corrosives. They are commonly employed to maim, not to destroy life. Vitriol-throwing used to be almost solely confined to the Continent of Europe, although occasionally met with in this country. Now, however, it appears to be more common. The acid is thrown upon the face, with the object of destroying the eyesight or spoiling the features. In Scotland, this is a crime both at common law and by statute.

The Act which deals with it is 10 Geo. IV. c. 38, sect. iii. "And be it enacted, That if any Person in Scotland shall, from and after the passing of this Act, wilfully, maliciously, and unlawfully throw at or otherwise apply to any of His Majesty's subject or subjects any Sulphuric Acid, or other corrosive substance calculated by external Application to burn or injure the Human Frame, with Intent in so doing, or by means thereof, to murder or maim or disfigure, or disable such His Majesty's Subject or Subjects, or with Intent to do some other grievous bodily Harm . . . being thereof lawfully found guilty, Actor, or Art and Part, shall be found guilty of a Capital Crime, and shall receive Sentence of Death accordingly." Section iv. enacts that if it shall appear at the trial that under the circumstances of the case, if death has ensued, the act or acts done would not have amounted to the crime of murder, such person shall not be held guilty of a capital crime or be subject to the aforesaid punishment; and section v. gives the Public Prosecutor power to restrict the pains of law in any case.

Vide Macdonald's "Criminal Law," pp. 145, 158;
Hume's "Commentaries," vol. i. p. 328, *note* 6.

Cases—James Wood, 1836, 14 years' transportation; 1. Swinton, 283.
[1] Ann Dewar or Beaton, 1842, 6 months' imprisonment; 1. Brown, 313.
Fitchie, 1856, 4 years' penal servitude; 2. Irvine, 485.
Fitzherbert, 1858, 15 months' imprisonment; 3. Irvine, 63.
Robertson, 12th May 1899, 5 years' penal servitude; High Court of Justiciary.

The law of England on this subject is embraced in the 24 & 25 Vict. c. 100, sect. 29:—

"Whosoever shall unlawfully and maliciously cause any Gunpowder or other explosive substance to explode, or send or deliver to or cause to be taken or re-

[1] Lord Moncrieff's charge to the jury in this case contains a valuable statement of the law applicable to the statutory charge.

ceived by any Person any explosive Substance or any other dangerous or noxious Thing or put or lay at any Place or cast or throw at or upon or otherwise apply to any Person, any corrosive Fluid or any destructive or explosive Substance, with Intent in any of the Cases aforesaid to burn, maim, disfigure, or disable any Person, or to do some grievous bodily Harm to any Person, shall, whether any bodily Injury be effected or not, be guilty of Felony, and being convicted thereof shall be liable, at the discretion of the Court, to be kept in Penal Servitude for life or for any Term not less than Three years,—or to be imprisoned for any Term not exceeding Two years, with or without Hard Labour, and with or without Solitary Confinement, and if a male under the age of sixteen years, with or without whipping."

As has already been pointed out, the diagnosis in such cases will depend on the following points, viz.: (1) The character of the lesions; (2) marks of staining, due to chemical action; (3) the absence of signs produced by fire or scalding liquids; (4) discovery by analysis of the corrosive used. The lesions are uniform in their general character—that is to say, they do not present the same multiformity of appearance as those by fire, or the singularity of vesication as by fluids or steam. The colour of the stains upon skin or clothing may afford a guide to the nature of the corrosive; thus, nitric acid causes a yellow stain due to formation of picric acid, sulphuric acid and caustic alkalies leave reddish-brown or dirty-brown marks, hydrochloric acid and carbolic acid, whitish or greyish-yellow stains on skin and mucous membrane; but in some cases the colour of the stain upon the clothing may be varied by the original colour of the fabric.

V. **Are the Lesions of Burning found of Accidental, Suicidal, or Homicidal origin?**—In most cases, the solution of this question will rest upon other than medical evidence. It may be safely asserted that by far the largest proportion of cases of deaths by burning and scalding occurs by Accident; that they are rarely suicidal; but that deaths by Homicide are by no means uncommon. Accident accounts for a great variety of cases; as, for example, old, helpless, or intoxicated persons falling into the fire, children falling into vessels of scalding water, adults falling into scalding vats of materials in the course of manufacture, or into molten metal, children pulling over upon their persons vessels containing boiling liquids, or attempting to drink boiling fluids, or playing with lighted material and setting their clothing, or bed-clothing, or even their home, on fire; so also from fires in buildings, from scalding in boiler explosions, from explosions of fire-damp in coal-pits, explosions of coal-gas, from gunpowder, or from paraffin-oil lamp accidents.

Homicidal burning or scalding is much less common than from accident, but from time to time deaths are caused by the wilful application of fire. It has been accomplished by throwing boiling water, by throwing a lighted paraffin lamp which has set on fire the clothing, or by a violent attack with a red-hot implement on a vulnerable part of the body; and by other methods.

The following are illustrative cases:—

1. At the High Court of Justiciary in March, 1886, an elderly woman was charged with having assaulted and caused the death of two children of the ages of four and three years respectively, by putting them on a fire of live coals.

The medical evidence from the post-mortem examination showed that the children had died from shock and exhaustion consequent upon extensive burns. She was found guilty of culpable homicide.

2. At the same Court, in 1894, a man named Paterson was charged with having assaulted a woman named M'Guire, and with his fists and a red-hot poker beat her and violently assaulted and murdered her. On the body four kinds of lesions were found, viz.—burns, wounds, bruises, and fractures. There were fifty different burns on the body of different sizes, all of which were superficial except two, one of which was deadly. The fatal burning was due to the penetration, *per vaginam*, of the peritoneal cavity by the heated poker. The medical witnesses were of opinion that the cause of death was peritonitis, caused in the manner already stated. The prisoner was found guilty, and was sentenced to death.

3. Some years before this, a man was charged with having caused the death of a boy by pushing a red-hot poker up into the anus. This was done by a tailor, who, working in an underground workshop, the window of which looked out on the pavement,—the front space in front of the window being covered by an open grating,—pushed the poker up through between the bars of the grating with the object of frightening some boys who were constantly annoying him at his work.

4. The following case was one in which we made a post-mortem examination of the body of a woman who died from burning, the result of a man having thrown a paraffin-oil lamp at her. The body presented very extensive marks of burning. The whole of the face, neck, back part of the scalp, the front of the chest as far down as the nipples, the back of the right shoulder, the whole of the right arm, forearm, and hand, all bore evidence of burning—involving, to some extent, the true skin. On the right side of the chest were some vesicles. Death was caused by meningitis and pleurisy, consequent upon the burning.

5. In another case, a mother was taken into custody on the charge of having, while she was in an intoxicated condition, put her infant of four months into a scalding bath. The body of the infant showed induration and inflammation of the skin of both lower limbs. On the left leg, extending from the knee to the little toe, was a band of burning from which the epidermis was denuded, and on the right cheek was an oval-shaped vesicle of half an inch in diameter. The cause of death was evidently shock and congestion of brain and lungs.

To these cases must be added those in which the assailant proceeds to saturate the clothing of his victim with an inflammable oil and then deliberately to set fire to the clothing. Homicidal burning may even be one of the forms of punishment assumed by lynch law.

In March, 1901, a negro in Navarro County, State of Texas, was apprehended upon a charge of a brutal criminal assault upon a white woman, of which, it was alleged, he confessed his guilt. Without any active resistance on the part of the authorities, he was taken out of gaol by an infuriated mob, tied to a stake in the yard of the Courthouse, his clothes were saturated with kerosene, and in presence of an immense crowd of men, women, and children, he was deliberately set on fire and burned to death. An inquest was held on the body by the coroner, whose official verdict was as follows: "That the deceased came to his just death at the hands of the incensed and outraged feelings (*sic*) of the best people in the United States, the citizens of Navarro and adjoining counties. The evidence, as well as confession of guilt by deceased, shows that this punishment is merited and is commendable. Given under my hand and seal at Corsicanna, Texas, this the 13th day of March, 1901."

Of the forty odd cases of burning and scalding which we have had to examine, in those which were fatal death was produced in some in an unusual manner. In one case, for example, a man fell into a cauldron of boiling maize in a distillery, and on the body being recovered, it was in the condition of "heat-stiffening," and it had assumed the pugilistic attitude occasionally seen in such cases. (Fig. 40.) The arms were extended from the shoulders, and the forearms, partially flexed. The legs also were partly flexed at the knees. From an analysis of our cases, including those narrated, we find that one was caused by gunpowder, two by molten metal, one by boiling porridge, two by

heated metal, one by red-hot poker, six by scalding fluid, one by falling into a tub of scalding water, two by setting bedclothes on fire, three by fire in different ways, fifteen by steam, two by lying upon heated "blaise" heaps (post-mortem burns); one where in addition to marks of scalding, the body was severely smashed in a railway accident, and two from lamp accidents. A very interesting case was as follows: By reason of smoke issuing from the doorway of a house, accompanied by smell of burning, the door was broken open by a policeman and the neighbours. On entering the kitchen whence the smoke was issuing, they discovered the body of a woman seated on a chair by an ordinary deal table, all — clothing, table, and chair — being ablaze. They extinguished the fire. Everything was left till we made our examination; and the following was what was seen: the dead body was in a sitting posture in an arm-chair which stood close beside a table. On the table was lying an overturned paraffin lamp with the reservoir empty, the wick end being toward the body: its funnel was found, unbroken, under a chair five feet away, whence it had evidently rolled. The clothing of the deceased was burned to a cinder; the face, breasts, chest, arms, hands, abdomen, and thighs were much burned generally, and in parts were literally roasted; vesicles, containing serum, were found on the forehead, arms, chest, and abdomen. The hair on the front of the head was burned and singed. The tongue protruded from between the teeth, and there was a bloody frothy discharge from the nose. Abundant deposits of carbonaceous matter were found, especially on face and chest. There were no wounds or other marks of violence upon the body. From these appearances, it was evident (1), that the woman had died of acute suffocation from the dense fumes and smoke of the burning oil; (2), that the lamp had fallen, or had been overturned by her, and that the ignited stream of oil running into her lap had set her clothes afire, giving rise to the above appearances. The case was made further clear by the statement of her husband, who was not in the house at the time of the occurrence, that he had gone out leaving her asleep on the chair in which the body was found, under the influence of alcohol. In another case, a woman under the influence of liquor, proceeded to fill her oil lamp and to light it, conducting the whole operation on her lap when sitting. In filling the reservoir she spilt some oil on her clothing, and when trying to light the wick with a piece of lighted paper, she set fire to her clothing, from which she was burned severely all over the body. She died from shock within a few hours after the occurrence.

FIG. 40 represents the "pugilistic" attitude sometimes assumed in bodies where death is caused by Burning or Scalding. The above is a drawing of a photograph of the body of a man who fell into a vat of boiling maize liquor in a distillery. (Author.)

Suicide by burning is rare, but cases are on record of persons who have precipitated themselves into vats or cauldrons of boiling fluid, or even into the molten metal of a furnace.

In determining whether any given case of burning is accidental,

suicidal, or homicidal, more information is likely to be obtained, as has been said, from the moral than from the medical evidence.

Post-Mortem Appearances.—While the external appearances on the body have been more or less fully described, something remains to be said respecting the internal appearances. Since death is likely to happen after burning from different causes, viz.: Shock, Asphyxia, Perforating ulcer of the duodenum, and Inflammation of the serous membranes, it is important in every case where the body bears externally the marks of burning, to examine most carefully for signs of these. Again, it is possible that certain of such cases may die from Carbon monoxide gas which is present in smoke; in which case, the blood ought to be examined for the spectrum of carboxyhæmoglobin.

Spontaneous or Preternatural Combustibility.—Among the earlier writings on medical jurisprudence cases are found recorded in which, it is alleged, the bodies of persons have spontaneously taken fire. Present-day opinion, however, is entirely opposed to the possibility of spontaneous combustion, for the simple reason that the human body, compatible with life, consists of about 75 per cent. of its weight of water. If, moreover, the accounts of most of the recorded cases are critically perused, it is not usually difficult to divine or discover conditions which lead to the conclusion that the cause of the combustion lay outside the body. Further, we may steep a carcase for months, or even years, in methylated spirit and at the end of the time set it on fire, but it will never be consumed in the efficient and rapid manner alleged to be the case of bodies spontaneously consumed. We are, therefore, forced to the conclusion that, up till the present time, no single undoubted case of so-called spontaneous combustion during life has been seen; and we are further warranted from the facts in saying that everything contraindicates its possible occurrence.

But while so much may be said of the living body, what can be said of the dead? Certain curious facts have, indeed, been further observed in the living. Beatson[1] states a case in which a man, subject to foul gastric eructations, one night got out of bed, struck a match to see the time, and in the act of blowing out the light, his breath took fire and made an explosive noise sufficiently loud to awake his wife. But such cases, unquestionably, are rare. It is well established, however, that during and consequent upon the action of certain micro-organisms upon composite organic substances, inflammable gases are generated; for example, that is so well known as a result of the bacterial treatment of sewage, that, at certain installations of the system, these gases are utilised for lighting purposes, as far as the quantity produced will permit. Such results have likewise been recorded of the dead human body by Gull,[2] Reynolds,[3] and others. In the statement of the facts by the first-named observer, it is affirmed that when punctures were made into the hyperdistended abdomen, inflammable gases escaped, which burned spontaneously on contact with the air with a flame like that of carburetted hydrogen. In Reynolds' case, certain extensive and deep marks of burning were found on the body, mainly on trunk and thighs, but there

[1] *B. M. J.*, vol. i., 1886, p. 295.
[2] *Med. Times and Gazette*, 1885. [3] *Med. Chron.*, 1891.

was no flame seen. So far as we are acquainted with such gases, the only spontaneously inflammable material which would so act, is vaporised phosphorus, or phosphuretted hydrogen, but either of these is hardly likely to be evolved from the body in that chemical form. The inquiry naturally arises, Were any observations made in such cases respecting the temperature of the abdominal cavity at the time these spontaneously-inflammable gases were issuing from the cavity? Obviously, this phenomenon could only arise under one of two sets of conditions: either that the substance evolved was in such a state that by its rapid oxidation by the air it burst into flame, or that it issued from the body cavity at such a high temperature that it only required oxidation to make it inflame. Whether the free and continuous use of alcohol has such an effect upon the tissues as to make them more inflammable is not yet clearly decided; one thing is clear that the inflammability cannot be due to the mere presence of the alcohol in the tissues, since the same results cannot be produced by steeping animal tissues in alcohol; and whether or not the subtle processes of physiological chemistry effect such changes and the formation of more highly inflammable products as to increase the general inflammability of the tissues of the human body, is a question which is still in the region of pure conjecture, and, therefore, any medico-legal bearing which it might have ought either to be entirely neglected, or ought not to be founded upon.

VI. DEATH BY CRIMINAL NEGLECT AND STARVATION.

Cases of death from this cause occur annually in this and other countries from one or other of the following causes, viz.: (1), sheer privation, as in famines; (2), accidental entombment in pits, mines, or landslips; (3), neglect on the part of parents or guardians; (4), from wilful withdrawal of food; (5), from wilful refusal to take food.

The criminal law takes cognisance of those cases which are due to Wilful Neglect and Simple unintentional Neglect. In addition to the crime of wilful starvation being an offence at common law, it falls, especially in the case of children, under statute law. The Infant Life (Protection) Act, 1872 (35 & 36 Vict. c. 38), was intended to control baby-farming under regulated municipal supervision so as to prevent baby-farmers from getting rid of infants surreptitiously. Its main provisions are as follow: 1. That hiring out of infant children for nursing where more than one child or twin children is kept, is contrary to the provisions of the Act; 2. That those houses in which infant children are nursed must be registered by the Local Authority; 3. That a register of names of persons and of the houses must be kept by the Local Authority; 4. That persons so registered must keep a register of the infants under their care and must produce it when lawfully required; 5. That such registered persons if found guilty of neglect, or incapable of providing proper care and attention to the infants under their care shall be struck off the register; 6. That if an infant dies in such registered house and no medical certificate of the cause of death be forthcoming, information

must be lodged by the registered persons with the Coroner in England and the Procurator-Fiscal in Scotland. The Prevention of Cruelty to Children Act, 1894—57 & 58 Vict. c. 41—enacts that if any person over the age of sixteen who has the custody, charge, or care of any child under that age, assaults, neglects, abandons, or exposes such child, or causes or procures such child to be assaulted, neglected, etc., so as to cause such child unnecessary suffering or injury to its health (including injury to or loss of sight, or hearing, or limb, or organ of the body, and any mental derangement), shall be guilty of a misdemeanour. Proof of interest in money accruable or payable in the event of the death of such child, and of knowledge that such money was about to accrue or become payable, is to be held as aggravation of crime. Section 2 deals with restrictions regarding the employment of children under sixteen for begging, singing, playing, performing, or selling wares in public places, or in places licensed to sell intoxicating liquor for the above purposes between 9 P.M. and 6 A.M., or to be trained as an acrobat, circus performer, or such like. Section 3 gives power to School Boards in Scotland to grant a licence for such time and during such hours of the day, subject to such restrictions and conditions as the Boards may think fit, for any child under seven: (*a*), to take part in any entertainment, in a circus or in other place of amusement; (*b*), to be trained as an acrobat, etc.; or (*c*), to do both; provided that the Board is satisfied of the fitness of the child for the purpose, and that proper provision has been made to secure the health and kind treatment of such child under such circumstances. The other sections of the Act deal with procedure, and with powers of inspection of places where children are employed as above indicated.

I. It will not be necessary to give more than one or two typical cases illustrative of each of the foregoing causes of starvation. Starvation from *sheer privation* is the common feature of all famines which occasionally visit some part of the earth. The Irish famine of 1847, however, and successive famines in India since, are typical.[1] Aitken gives an interesting account of a sad case of privation, as follows[2]: In February, 1862, a man 36 years of age was discovered in a stack near Morpeth, dying from starvation. All attempts to rally him failed, and he died. He had been editor and proprietor of a small newspaper. A diary was found in his possession which contained entries of his condition from the 8th to the 25th of that month. From these it appeared that during seventeen days he had twice only tasted a piece of bread, but for the last thirteen days he had been entirely without food. During the first ten of these thirteen days he was able to go for water, but on the eleventh his legs became useless, and he lost all motor power in his limbs, so that, as he expressed it in his diary, "one-half of my body appeared to be dead." Shipwrecked crews sometimes undergo great privation. In the *Times* for February 6 and 7, 1866, is a graphic account of the sufferings of such a crew which consisted of the captain and seventeen men, who were absolutely without food and fresh water in their boat. The periods during which some of them lived under this total privation were noted, viz.: one lived eleven days, one, twelve days, one, fourteen days, two, fifteen days, one, eighteen days, and the captain, twenty-eight days; the prolongation of the captain's life being apparently due to the fact that by tying his cravat around the mast to catch the falling rain and sucking it when it was soaked, he obtained some water. Neglect on the part of Parents and Guardians is punishable under statute law, as has been said, and cases are, unfortunately, too common to require detailed consideration. But the following are probably outstanding. First, with reference to

[1] *The Lancet*, vol. ii. 1879, p. 774.
[2] *Science and Practice of Med.*, p. 744.

adult persons. In such cases, criminal starvation is most likely to be practised only in the case of persons who are ill or weakly, or of half-witted individuals who are kept in secret by their friends. The most notorious case of the last quarter of a century was the Penge case, 1877, one of the persons convicted in which being liberated from prison only in 1898. The facts were, shortly, these: Harriet Staunton was the wife of one of the prisoners, and the allegation was that she had been starved to death by her husband, his mistress, his brother, and sister-in-law, and another woman, Rhodes by name. She was seen by a medical man before her death, who gave a certificate that death was due to natural causes. But suspicion as to the manner of her death having been aroused in the neighbourhood, a post-mortem examination of the body was made, and upon the facts found was based the charge against the prisoners. The examination showed the following, viz.: that the body was greatly emaciated and in a very dirty, uncared-for state; that although the woman's height was 5 feet 5½ inches, her body only weighed 74 pounds, whereas it was shown in evidence that about a couple of years before, she weighed 119 pounds; that there was an entire absence of fat from the body; that the gastro-intestinal tract had thinned walls; and that the only evidence of disease in the body consisted of some miliary tubercles in the *pia mater*, and a small patch of tubercular deposit in the apex of the left lung. The medical evidence at the trial being in favour of death having been caused by starvation, the prisoners were found guilty, and they were sentenced to death. Thereafter, comments were made freely in the medical press regarding the rôle which the tubercular disease found in the body had played in the production of the signs of starvation. Some affirmed that death was due to, or at least was hastened by, tubercular meningitis; others that the death was purely the result of starvation, in the course of which, and by reason of which, the tubercular deposits had developed. The division of opinion became so acute that the Home Secretary reviewed the facts of the case, and, after deliberation, the woman Rhodes was pardoned, and the sentences against the other prisoners were commuted to imprisonment.[1]

II. From **Neglect of Children** many cases might be recorded; but the following are typical.

1. The first case was known at the time as the Chester Case.[2] A child was placed in the hands of a woman to nurse. Sometime after, it was found by an inspector of police lying in a basket in front of the fire of the woman's house, in a horribly emaciated condition. Although eighteen months old, it only weighed 8 lbs. 2 oz.—practically a little more than the weight of a newly-born child. It was proved in evidence that the child was given only skim milk twice a day, and, in the interval, the empty nursing-bottle to suck.

2. In the Hastings Case,[3] the servant girl at a boys' school was found by the medical men, apparently dying of starvation. There was extreme emaciation, hectic fever, and the peculiar odour of starvation.

For other cases, see the following references:—

B. M. J., vol. i. 1880, p. 175.
,, ,, 1880, p. 984.
,, vol. ii. 1880, p. 861.
,, ,, 1880, p. 949.

Cases such as the preceding led to legislation on the subject, and to the passing of the Infant Life Protection Act, 1872, and the Prevention of Cruelty to Children Act, 1894, the main provisions of which have been already given.

The Prevention of Cruelty to Children Act, 1894, repealed certain parts of the Act of 1868 which dealt with the same subject.

Section I. of the Act of 1868 enacts that if any person "who has the custody, care, or control of any child under the age of 16 years wilfully assaults, ill-treats, neglects, abandons, or exposes such child . . . in a manner likely to cause such child unnecessary suffering or injury to its health . . . that person shall be guilty of a misdemeanour." In a case tried before Mr. Justice Wills and a jury, he directed the jury that motive of the parents did not enter into the case, if what they did was expressly forbidden by statute. This direction was appealed against

[1] Central Criminal Court, 1877.
[2] *B. M. J.*, vol. i. 1880, p. 256.
[3] *The Lancet*, vol. i. 1880, p. 693.

and taken to the Court for Crown Cases Reserved in Dec. 1898, when the Lord Chief-Justice, with five other judges concurring, upheld the direction of Mr. Justice Wills. The term "wilfully" he defined as an act done deliberately and intentionally, not done accidentally or by mistake or inadvertence; and "the term 'neglect' meant the absence of such reasonable care as an ordinary parent would reasonably use for the protection and care of his child; in other words, the failure to take such steps for the protection of infant life and health as the general experience of mankind showed to be right and proper, providing, of course, that the means of rendering such treatment were within the reasonable power and competence of the person on whom the duty rested to render them."[1] The above judgment was given against a man Senior—one of the "Peculiar People"—who was convicted of neglecting to provide medical aid to his child and sentenced to four months' imprisonment with hard labour.

III. **From Accidental Entombment in Mines, Pits, or otherwise.**—One of the most interesting cases falling under this head is that recorded by Dr. Sloan of Ayrshire,[2] of a miner, 65 years of age, who was entombed in a pit for twenty-three days, at the end of which he was brought out alive, but died on the third day thereafter. At the beginning of his incarceration, he was able to get water which was strongly impregnated with iron, but, after several days, was unable from weakness to go even the short distance for it. In the Transactions of the Linnean Society,[3] as showing the effect of entombment on animals, a case is recorded of a fat pig which, by reason of a landslip on the Dover Cliff, was embedded thirty feet in the débris, but which at the end of 160 days was dug out alive although its weight had diminished from 160 to 40 lbs., a loss of no less than 75 per cent.

IV. **Wilful Refusal to take food** is a feature of the insane, and of the hysterical girl or woman, but it has been manifested as a mode of effecting suicide. Under this latter category is the case recorded by Casper,[4] in which a male prisoner attempted to starve himself to death. The prisoner, who was 36 years of age and had been sentenced to imprisonment for fraud, at the end of a year of his term determined to starve himself. For practically ten whole days he resolutely refused all food, but at the end of that time natural cravings obtained the mastery over his will, and he was permitted gradually to resume his ordinary diet. Woodman and Tidy[5] record the case of another prisoner who died at the end of the 58th day of his suicidal abstention from food.

Among confirmed lunatics, starvation from total abstinence from food may be said to be comparatively common. Cases are upon record where, when water was taken, the patients lived after they refused all food for 42, 47, and 61 days respectively.[6] Some notice must be given to fasting girls and fasting women. From time to time attention is attracted to cases, especially in young women, where there is deliberate refusal to take food owing to expressed repugnance to it. It would be impossible to enter into such cases in detail. In addition to that of Ann Moore—the fasting woman of Tetbury—whose fraudulent simulation of fasting was detected by a watch committee who discovered that when watched (her bed and herself being meanwhile placed on a weighing-machine) she lost weight, and to whom she confessed her fraud—there are the cases recorded by Drs. Ogle,[7] Fowler,[8] and Dougal.[9] In the case of Sarah Jacob, when a watch committee was appointed to test the *bona fides* of the girl, she gradually lost weight and died; whereupon her parents and the medical men of the committee were brought up on a criminal charge of "killing and slaying her." In the case recorded by the last-named observer, it would appear from the facts narrated that the girl for a period of eighteen weeks, with the exception of a small piece of fruitcake, absolutely abstained from all food, although she took water and sweets freely. Her bowels did not move for eleven weeks. The last measure proposed to her

[1] *B. M. J.*, vol. ii. Dec. 17, 1898.
[2] *Med. Gazette*, vol. xvii. pp. 264-389, 1835.
[3] Vol. xi. p. 411.
[4] *Op. cit.* vol. ii. p. 29.
[5] *Op. cit.* p. 1036.
[6] Willan, "Miscellaneous Works," p. 437.
[7] *B. M. J.*, vol. ii. 1870, p. 57.
[8] "History of the Case of Sarah Jacob," p. 307.
[9] *The Lancet*, vol. i. 1881, p. 755.

was that if she did not eat she would be taken to a lunatic asylum. For a short time this had some effect in making her try to eat, but she again declined all food, and ultimately died. For more than a year, therefore, this girl, with the exception of water of which she partook freely, some sweets, and beef-tea at odd intervals, and a bit of biscuit or of orange very rarely, abstained from food. She became morose in disposition before her illness—because it must be deemed such—began when she was 14 years of age, and this continued throughout until her death.

It is not necessary to discuss those persons who fast in public exhibitions—for a consideration. Their cases make no solid contribution to the literature of the subject.

Starvation obviously may arise also from inability to take food by mechanical impediment or disability in the digestive tract, or by reason of disease in the body.

Ankylosis of the jaws is a rare form of disability, but such a case is recorded by Casper,[1] which was due to the careless use of mercurial inunctions by a surgeon, who was therefor condemned to imprisonment. Stricture of the œsophagus from corrosion and cicatrisation after swallowing burning materials or corrosive substances, or from cancerous or other malignant disease of gullet or stomach, are by no means uncommon causes. Of the diseases which present externally apparent signs of starvation, probably those of tubercular origin are the chief, with the exception of *diabetes mellitus.*

Signs of Death from Starvation.—There are some good grounds for dividing deaths by starvation into two classes, viz.: Acute and Chronic; the former, when it occurs within fourteen days from the withdrawal of food, and the latter, when the death takes place beyond that number of days.

As it is sometimes necessary for a medical witness to make examination of living persons believed to be the subjects of neglect and starvation, it is essential that some note ought to be taken of the phenomena attendant upon the process. These may be considered as follows:—

1. As regards the bodily temperature;
2. As regards the pulse;
3. The loss of body-weight;
4. The peculiar odour exhaled;
5. Other and varying signs.

As regards temperature, the general effect of the non-nourishment of the body is that it becomes sub-normal after a shorter or longer period of feverishness, and that prior to death, the fall may amount to two or three degrees below normal. As respects the pulse, the progress of a case shows that, at first, the pulse becomes more rapid and, later, slower, but as inanition advances and death approaches, it again rises in frequency. Dr. Fowler observed in the case of Sarah Jacob, the fasting girl, that her pulse increased 14 beats on the second day of the watch by the committee, 26 on the third, 54 on the fifth, and 74 on the third, over the pulse-rate at the beginning of the watch. The most outstanding sign, however, is the loss in body-weight, since the body deriving no nourishment from without, must feed upon itself. Fraudulent fasting may, indeed, be unhesitatingly declared to exist where the body-weight is maintained after the alleged fasting has been in existence for some time, and especially when upon a strict watch being instituted, it is found to steadily fall; as

[1] *Op. cit.* vol. ii. p. 33.

was seen to happen in the cases of Ann Moore and Sarah Jacob. Generally speaking, it may safely be affirmed that it is not compatible with the maintenance of life that a body should lose more than one-quarter of its original weight. Chossat's famous experiments on pigeons showed that when these birds were totally deprived of food, the surplus fat of the body was first used up, then the fatty envelopes of the internal organs, and last of all the interstitial fat of the muscles, while the muscles themselves became smaller by reason of want of nutriment. In all bodies the subject of death from this cause a peculiar odour is given off. The nurse who watched the Welsh fasting girl, Jacob, called it a "peculiar" smell, "not like the usual smell of death," but she could not definitely describe it. Dr. Donovan, who recorded his observations of deaths in the Irish potato famine, called it "an offensive odour"; and other observers have given it like names. It is a fact well known to all who have to attend deathbeds, that before death, odours more or less disagreeable are evolved from the body. Dr. Isham[1] is inclined to attribute the phenomenon to the liberation of ammonia and of the peculiar volatile oil (fatty acid) which gives the blood of animals its odour, and to the liberation being caused by the diminishing vitality of the blood. It is very probable that the odour from a starved body may be based upon such facts.

Of the minor signs of starvation, the following may be noted, viz.: sunken eyes, with a wild and glistening expression from the dilated pupils; prominent bony projections of facial features; pale and parched lips; red, hard, and dry tongue; weak, whispering, "cholera," voice; undue prominence of bony framework of body; sunken abdomen; wasted extremities; constipated bowels; fæces small, ball-like, hard, and dry; urine scanty, turbid, and dark-coloured.

Post-Mortem Appearances.—These may be considered under three heads, viz.:—

I. Body generally.
II. Solid Viscera.
III. Hollow Viscera.

I. General Appearances of Body.—There is considerable emaciation of the whole body; the skin is in folds, or is wrinkled or shrivelled, dry, and, sometimes, covered with a brownish-like varnish; the muscles are flabby, much wasted, devoid of fat; the abdomen is greatly sunken, so much so at times as to appear as if the abdominal wall touched the vertebral column; the eyes are sunken, the temples are hollow, and every bony prominence appears unduly prominent. A peculiar odour from the body is observed.

II. Appearances of the solid Viscera.—The lungs, heart, and great vessels are comparatively bloodless and collapsed; the liver, kidneys, spleen, etc., are small, shrunken, and devoid of enveloping or interstitial fat; the omentum and mesentery are either clear and without fat, or have practically disappeared; the gall-bladder is full of dark bile; and the urinary bladder empty, or nearly so.

III. Appearances of the hollow Viscera.—The stomach is found contracted, collapsed, thinned, and empty. In Casper's case from

[1] *American Journal of the Medical Sciences*, April 1881.

ankylosis of jaws it was found so much contracted that its calibre scarcely equalled that of the normal colon. The intestines are found in the like contracted condition. This thinning is sometimes so marked that food can be seen and recognised through the almost transparent walls. Donovan, in the case of one of the victims of the Irish famine, was able to recognise a piece of raw green cabbage through the wall of the duodenum. Not only are the intestinal coats thinned, therefore, but the calibre of the canal is much contracted, even to one-half of its original size.

In all cases of suspected death from starvation, every appearance of disease, if and when present, must be carefully noted on dissection, and where absence of disease exists, the fact should be equally noted.

In questions of survivorship, and in certain criminal connections, it may be asked of the medical witness, How long will a person live after *complete* privation of food? This is difficult to answer in a general way, and the answer must have special regard to the age and state of the person. It is an axiom that the young and the aged resist less easily than the adult; but if the answer be confined to adult life, then it may be said that the average period is from 7 to 10 days: if, however, water be obtainable for a portion of the time of compulsory fast, the period may be extended, as in the case of the Ayrshire miner, to 23 days. Tidy,[1] with respect to survivorship is inclined, however, to the view that the young die first, adults next, and the aged last, on the ground that old people need less nourishment than the young or the middle-aged adult; but he takes no reckoning, evidently, of the weakened vital forces of the aged as a factor which would be contributory to feebler resistance. We believe that, by reason of the more vigorous vital forces of the young or the middle-aged adult, he or she would resist starvation better than the aged person. Where water is freely obtainable, life may be prolonged to the 58th day.[2]

Accidental, Suicidal, and Homicidal Starvation.—We need hardly discuss further the cases of starvation which fall within the two first categories, as the circumstances attendant thereupon are usually sufficiently obvious to be easily proved by lay witnesses. It is not so, however, in the last class; usually, medical evidence is of the greatest importance in such cases. Culpability is of varying grades with respect to the inadequate nutrition of children or helpless persons, and it is in cases involving cruelty to children from neglect and starvation, or in helpless persons being starved to death, that the medical witness may prove helpful to the criminal authorities. Parents are responsible for the nourishment of their children; employers, for their domiciled apprentices or servants; and other persons for those who are by law dependent upon them, and who are unable to provide for themselves by reason of any defect, mental or physical, or both. It is considered to constitute the crime of infanticide by omission where a mother wilfully withholds nourishment from her infant so that it dies.

At the Assizes at Leicester in 1877—R. *v.* Mills—the woman was charged with the manslaughter of her infant (an illegitimate child) by neglecting to

[1] *Legal Med.*, vol. i. p. 392.
[2] *Foderé*, vol. ii. p. 276.

suckle it, and for neglecting to see that it was fed otherwise. In R. *v.* Scott (C. C. C., August 7, 1880) the woman was charged with starving her servant, and was sentenced to two years with hard labour. In starvation of apprentices or servants, it was held in R. *v.* Squire[1] that it is the husband and not the wife who is responsible, although in certain cases, the wife may be charged as an accessory. As the result of the death of the Welsh fasting girl, Sarah Jacob, the father and mother of the girl were tried at the Carmarthen Summer Assizes, in 1870, on the charge of criminal neglect of their child, and, after evidence, were convicted, the father being sentenced to twelve months', and the mother to six months' imprisonment. The medical members of the Watch Committee were charged with "killing and slaying Sarah Jacob," but they were acquitted, on the ground, it is believed, that neither the other members of the committee nor the nurses asked their advice. This case ought to act as a wholesome warning to medical men to set their faces not only against all such cases as fasting people, more especially when it is established that in spite of the fasting the body-weight of the person is being maintained, but also to decline taking any part in their exposure. Of cases in which death was attributed to starvation from wilful withdrawal of food by those responsible for the proper nourishment of the persons whose deaths have been so caused, probably the Penge case, the facts of which have been already recorded, would suffice. Other cases, however, have been recorded, viz.: R. *v.* Mitchell tried at the Oxford Lent Assizes, 1861, where Mitchell, a naval surgeon, was tried for the manslaughter of a female servant aged 24, by starvation, but where, although the post-mortem appearances were indicative of this form of death, the medical witnesses admitted that they might be due to mal-assimilation. The prisoner set up the defence that the woman suffered from chronic diarrhœa. He was acquitted.[2]

There are, however, cases under the Cruelty to Children (Prevention) Act, 1894, to be considered, as well as those cases denominated Criminal Neglect, where persons, such as the "Peculiar People," wilfully withhold medical treatment from their children, and by doing so are contributory to their deaths.

In the former class of cases, the medical examiner must take cognisance of the following points, viz.:—

(*a*) The condition of the children with respect to cleanliness of person, and of clothing;

(*b*) Their condition with respect to bodily nutrition.

Nothing need be said at length with respect to the former. Dirty, unkempt, imperfectly-clad children offer clear indications of the absence of proper motherly care, for, however poor a careful mother may be, she may, at least, be cleanly as regards her home and her family. These conditions, when found, may be taken as sufficient evidence of general neglect. But the medical examiner must exercise special care in the consideration of the state of nourishment of the children. Imperfect nutrition as shown by relation of growth to age, and of height to weight, may arise from different conditions, such as inherited or acquired disease, or feeding, insufficient or inappropriate as to quality, and kind of food.

The following Tables from the Report of the British Anthropometric Committee (1883) may prove of service, as showing the average weight and height of children up to twelve years of age:—

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[1] Starkie, vol. ii. p. 947.
[2] Taylor, *op. cit.* vol. ii. p. 142.

MALE CHILDREN.

Age.	Height.	Weight (lbs.).
At Birth	...	6·8
One Month	...	7·4
Two Months	...	8·4
Three „	...	9·6
Four „	...	10·8
Five „	...	11·8
Six „	...	12·4
Seven „	...	13·4
Eight „	...	14·4
Nine „	...	15·8
Ten „	...	16·8
Eleven „	...	17·8
Twelve „	...	18·8

Age.	Height in Inches.		Weight in Lbs.	
	Female.	Male.	Female.	Male.
One Year	27·5	33·50	...	18·8
Two Years	32·33	33·70	25·3	32·5
Three „	36·23	36·82	31·6	34·0
Four „	38·26	38·46	36·1	37·3
Five „	40·55	41·03	39·2	39·9
Six „	42·88	44·00	41·7	44·4
Seven „	44·45	45·97	47·5	49·7
Eight „	46·60	47·05	52·1	54·9
Nine „	48·73	49·70	55·5	60·4
Ten „	51·05	51·84	62·0	67·5
Eleven „	53·10	53·50	68·1	72·0
Twelve „	55·66	54·99	76·4	76·7

TABLES OF AGES, HEIGHTS, AND WEIGHTS OF MALES AND FEMALES FROM 13 TO 30–35 YEARS OF AGE.

Years of Age.	Males.		Females.	
	Height in Inches.	Weight in Pounds.	Height in Inches.	Weight in Pounds.
13	56·91	82·6	57·77	87·2
14	59·33	92·0	59·80	96·7
15	62·24	102·7	60·93	106·3
16	64·31	119·0	61·75	113·1
17	66·24	130·9	62·52	115·5
18	66·96	137·4	62·44	121·1
19	67·29	139·6	62·75	123·8
20	67·52	143·3	62·98	123·4
21	67·63	145·2	63·03	121·8
22	67·68	146·9	62·87	123·4
23	67·48	147·8	63·01	124·1
24	67·73	148·0	62·70	120·8
25–30	67·80	152·3	62·02	120·0
30–35	68·00	159·8	61·15	120·8

Careful investigation should be made for the existence of disease, or for evidence of causes of mal-nutrition in children, whenever serious disproportion is discovered in any case, or group of cases, between the actual and average age, height, and weight. Although the above Table only shows averages, and although in any case, or series of cases, divergences in these relations are likely to present themselves, it may be taken to indicate data sufficiently near the normal with which to compare when serious disproportions emerge. In order, therefore, to establish evidence of imperfect or inappropriate nourishment, as to quantity, quality, or kind of food, it is not only necessary to eliminate diseases or conditions causative of mal-nutrition, but to review such evidence as there may be of the feeding given to the children. This is especially necessary in cases in which homicidal starvation is charged against accused persons, for the lines of defence most usually adopted are either the existence of disease or causes of mal-assimilation or mal-nutrition; therefore, in the post-mortem dissection, all evidences of disease, if present, must be noted with relation to their effect upon the production of emaciation, for if no gross lesions be found in the body, no sugar be found in the urine, nor chronic nephritis in the kidney, there would be sound, substantial ground for inferring that death was due to want of sufficient nourishment. But within the term "neglect" of children, the law brings others than those who simply do not provide reasonable nourishment for their children, such as the Peculiar People who would rather trust in prayer and the Word of God than to medical aid in the illness of their children, and the so-called Christian Scientists whose belief is centred in faith-healing. With respect to the former, in cases where it can be reasonably shown that in consequence of the non-intervention of medical aid a child dies, the law is that such parents have "neglected" their child in terms of the Act already quoted. As regards the law respecting the doctrine of "Christian Science," the only deliverance in this country was that given by Mr. Justice Hawkins in the celebrated case of R. *v.* Lyon and Mills, in which the death of Mr. Frederic, a journalist, was in question. A coroner's jury had returned a verdict of manslaughter against the accused. The Treasury thereupon took up the case, which was tried before the Croydon justices, but after an inquiry lasting several days, the prosecution withdrew the case against Miss Lyon, and asked for a committal against the second accused. The justices, however, were of opinion that the evidence even against Mrs. Mills was not sufficient to justify them in sending her to trial, and she was likewise discharged. But the accused had to be indicted upon the finding of the coroner's inquiry, and so the case came up at the Central Criminal Court, for trial before Mr. Justice Hawkins; but counsel for the Treasury, after consultation with the Attorney-General, departed from the case, and therefore, the judge had no other alternative than to direct the jury to return a verdict of not guilty; at the same time, he pointed out that he was in no way responsible for the withdrawal of the case, and he declined to share even the responsibility with the Crown in so acting. It may, therefore, be said that as yet no deliverance has been given by the law on this subject, since the statute only deals with the neglect of those who are under sixteen years of age.[1]

[1] *B. M. J.*, vol. ii. Dec. 24, 1898.

CHAPTER IX.

MEDICO-LEGAL FORMS OF DEATH (*continued*).

VII. DEATH FROM COLD AND EXPOSURE.

This is one of the rarest forms of death in this country, chiefly by reason of its geographical position in the temperate zone, the average number of deaths per annum being between 150 and 175. It may be said to have its physiological cause in the driving-in of the blood of the peripheral circulation from the contraction of the blood-vessels of the outer integuments by the influence of the cold into the vital centres, so that fatal hyperæmia of brain, lungs, and heart is produced. The liability to death from this cause is slight comparatively in the case of exposure of the robust person in rude health, but it becomes considerably increased in the case of newly-born infants, young children, the aged, the weak, the half-starved, and the mentally-depressed. The factor of intoxication, doubtless, plays an important part in many cases, since in drunkenness the bodily temperature is, or readily becomes, sub-normal. From careful thermometric observations *per rectum* in "dead drunks" we make this assertion with confidence; consequently, exposure in inclement weather of such persons is more liable in their case to conduce to the above form of death. Few observers, comparatively speaking, have had opportunities of recording many cases, and, probably, the experience of the late Prof. Ogston of Aberdeen is as large as that of any observer in this country. His attention was first called to the subject in 1837 on account of his having been called upon to make an examination of a body the subject of death from this cause. When he published his Lectures in 1878, he had seen, during the interval, sixteen cases—ten of which were adults and six were children. Casper [1] records four cases in children. Dr. Kellie [2] recorded two cases. Associated, occasionally, with death from Cold and Exposure, is frost-bite. This is common in countries with Arctic climates in winter, but very uncommon in our own. Casper affirms that bodies have been found frozen so hard that the brain had to be chiselled out before the base of the skull could be examined, and food, hard frozen, was found in the stomach. In order that frost-bite may supervene, however, it is not necessary that there should be actual exposure in the open air, as the following facts will show:—

During the severe winter of 1879, we were asked to see an infant, four months old, who lived with its parents in the outskirts of Glasgow in a new, but badly-made tenement-flat. The child was well-nourished and healthy. We found the left little toe completely gangrenous, so that it was attached to the foot only

[1] *Op. cit.* vol. ii. p. 278.
[2] *Trans. Med. Chir. Soc. of Edinburgh*, vol. i. p. 84.

by the remains of the tendons. The like toe of the right foot was in a similar condition, but the gangrene was not so severe. The history was as follows: On the Saturday, the mother bathed the child. There was then nothing unusual about the feet, which were covered with woollen boot-coverings. The next day, the child was not bathed, nor were its feet uncovered, because the water-supply had become frozen during the night, and as any other supply could only be procured at some distance by carrying it in a pitcher, as little water as possible was used. The infant cried bitterly all that day. On the following day, the feet were again uncovered, when, to the astonishment of the mother, the left little toe was found to be black all over, and the right little toe similarly, but not so deeply, coloured. She, of her own device, applied warm poultices of bread and milk, which, doubtless, hastened the gangrenous separation. As indicating the conditions under which the family had to live at that time, it must be stated that in spite of a continuous fire in the grate, a wet cloth or sponge, left lying not far from the fire, quickly froze, owing to the badly-fitting doors and windows, and the consequent free indraught of cold air.

The intimate cause of death by cold has been ascribed to the fact, ascertained experimentally on blood, that at zero, oxygen becomes less easily dissociated from the hæmoglobin, and, therefore, death is due to the oxygen-starvation of the brain and nerve-centres. This would account, partly, for the extreme drowsiness which overcomes those who have been exposed for some time to rigorous weather, although, doubtless, the severe muscular efforts to overcome difficulties and in trying to attain shelter are also important causative factors.

Post-Mortem Appearances.—These consist mainly in the following, viz.:—

Externally.—(1) The presence of irregular-shaped, dusky-red patches or stains on limited areas of the surface of the body. The situation of these is determined by the parts of the skin which are exposed to the air, because they are not formed upon covered portions of the body. They must not be confounded with post-mortem lividity, because they are met with on non-dependent parts, nor with the cherry-red diffused coloration of the skin in CO poisoning which is found equally upon parts exposed to, and covered from, the air. These coloured marks appear cherry-red owing to the more marked contrast caused by the unusual pallor of the rest of the skin of the body. Such coloration of the skin is found to some extent, as has been already pointed out, in deaths by drowning, particularly upon the skin over the malar prominences and in the mucous membrane of the lips. In all the cases in which we have seen this, the deaths have happened in intensely cold weather, the temperature being below freezing-point. There can be little doubt that, in these circumstances, the phenomenon is due to oxygenation of the blood by the air through the thin walls of skin and mucous membrane; and the same factor is, in all probability, the cause of the dusky- or cherry-red coloration of the skin of exposed parts in deaths from cold and exposure. Falk[1] has expounded this view. He affirms that at temperatures below zero, the hæmoglobin of the blood of the skin of the dead body is capable of combining with oxygen and of retaining it as a fairly firm combination, but when the surrounding temperature rises the hæmoglobin parts with its oxygen to the adjacent tissues, the skin loses therefore its red colour, and the stains become like ordinary post-mortem stains. But it ought to be

[1] *Vierteljahrsschrift für. gericht. Med.*, 1887 *u.* 1880

remembered in this connection, as possibly throwing some light on the production of such stains, that blood exposed to a temperature of 10° to 15°C. below zero not only solidifies, but the red corpuscles are ruptured. This was described by Pouchet in 1866, and later by Maljean.[1] The effect of freezing upon flesh meat is shown by the simple test of placing a small piece of the meat in a test-tube containing water, or, better, by expressing on a glass-slide some of the meat juice. If the meat be fresh, microscopic examination will show numerous red discs, normal in shape and colour (if the treatment has been by the latter method), floating in a colourless *liquor sanguinis;* but if the meat has been subjected to freezing, or has been "chilled," for purposes of transport, a like treatment of a small piece of it will show red discs more or less distorted in shape and without colour, floating in a *liquor sanguinis* remarkably red or dark in colour. By the test-tube method, the water, in the case of frozen meat, becomes more rapidly and more notably coloured than in the case of fresh meat, indicating that the colouring-matter of the blood in the former is dissociated from the corpuscles by the action of the cold. It would appear, therefore, as if there was some destructive action of the corpuscles either during the period of freezing or chilling, or during the period of thawing or raising of temperature.

(2) General pallor of the covered surface of the body. This is due to the absence of blood from the skin due to its being driven into the interior of the body. In Ogston's series of cases, this general pallor was constantly observed.

Internally.—The principal appearances are as follows:—

(1) An arterial hue of the blood throughout the body. This, obviously, is due to combination of the oxygen of the air with the hæmoglobin. When, however, the blood in the heart is viewed *en masse*, it has a dark colour. Ogston failed to find this general arterial coloration of the blood in two cases. This is to be expected; for the amount of oxygenation must depend upon two factors in any given case, viz.: (*a*), the temperature of the air during the period of exposure, and (*b*), the length of time of exposure.

(2) An unusual accumulation of blood in the centres of circulation; in other words, the cavities of the heart and the large blood-vessels will be abnormally full of blood, owing to the blood of the peripheral circulation being driven into the centres of circulation. According to certain observers, anæmia of the internal organs has been met with. In Ogston's series, hyperæmia of the brain was found in three, and hyperæmia of the liver in seven of the cases.

(3) Punctiform extravasations of the blood under the epithelium of the gastric mucous membrane. This internal sign was found to be constant by Wichniewski[2] in a series of 44 deaths from cold. From his description, however, it is not quite clear whether these were hæmorrhages or minute collections of blood-colouring matter, the doubt arising from the fact that they could be detached from the epithelium without apparent breach of continuity of surface.

In 9 cases observed by Blosfield of Kasan, the foregoing signs,

[1] *Journ. Pharm. Chim.*, 1892, 25, p. 348.
[2] *Archives de l'Anthrop. Crim.*, 1895.

both external and internal, were found; in 5 bodies examined by Krajewsky, the pallor of, and dusky-red patches upon the skin, were found; and other observers, in smaller series of cases, have also noted these main signs.

In arriving at a conclusion in any given case that death was due to exposure and cold, it is essential that not only the post-mortem signs upon and in the body should be taken into account, but also the concomitant circumstances; and in no case, in view of the likeness of the coloured marks on the skin to those of CO poisoning, should a spectroscopic examination of the blood be omitted.

It sometimes happens in cases in which the body has been exposed to a temperature below zero, that evidence of freezing will be found upon the body. If the freezing be general, the body will be absolutely rigid as in the most marked *rigor mortis*. This condition may be differentiated from *rigor mortis* by the fact that if a joint be forcibly flexed, it is accompanied by audible crackling sounds, which are not found in a similar operation in the case of a joint stiff from *rigor mortis*. Some indication as to the time the body has been exposed may also be afforded by watching the behaviour of the body during and after thawing. It is well known that the carcase of an animal which has been frozen immediately after it has been killed does not undergo *rigor mortis* until it has been thawed, and that although the stiffening does then appear, its duration is much shorter and it is less marked than it would have been had the *rigor mortis* appeared in the usual course. In a dead body, therefore, in which the stiffening appeared after thawing, it could be said, at least, that the body had been exposed prior to the usual time of onset of this phenomenon, and, if the foregoing signs were found on and in the body, that in all probability death was caused by the cold and exposure. Besides, it is not inconceivable that a body, having upon it marks of violence and at the same time, signs of death from cold and exposure, might be found in a lonely place. In such a case, the place where the body was found ought to be carefully examined, especially when wounds are found upon the body, before the balance of evidence is finally adjusted in the determination of the cause of death.

Whether is the Death due to Accident, Suicide, or Homicide?—It may be taken as a well-established statistical fact that in the bulk of cases death is due to accident. During the winter of 1881, an old, weak-minded man escaped the vigilance of his friends and wandered into the country in the neighbourhood of Glasgow. Snow fell during the period he was amissing. He was discovered two days after on a lonely hill-side by a shepherd's dog, and on the shepherd coming up, he was found to be still alive, but he died almost immediately after his removal to comfortable quarters. This may be taken as one type of case in which this form of death results; intoxicated persons lying down on a roadside in cold inclement weather, as another; and young children who have wandered during similar weather, as a third. Such a death occasionally happens, however, in the case of strong men, but this is rare; it was more common in the old coaching-days than now. Casper[1] narrates an interesting case of an unmarried woman who gave

[1] *Op. cit.* vol. ii. p. 278.

birth to a male child during very severe cold weather, on the floor of her house. After her delivery, and while the child was still lying on the floor (there being no assistance at hand), she became unconscious, and on her coming to herself, she found her child dead and the body quite cold. Although her narrative of the occurrence is very circumstantial, there is left in the mind of the reader a lingering suspicion that it was, to say the least of it, a curious accident.

Suicide by Cold may be considered so rare as to be left out of consideration.

But cold and exposure have been used with homicidal intent. A few such cases have been recorded, but two will suffice for illustration. Dr. Ozonam of Lyons[1] records one in which a girl, eleven years of age, was forced by her father and stepmother into a barrel of water on a cold night in December, and, although the girl was rescued by a servant, she was again forced back by the parents. She died in consequence of this treatment. After trial, the stepmother was condemned to imprisonment for life. Another case—R. *v.* Lovell—was tried at the Gloucester Lent Assizes, 1853, and the charge against the woman was that she had forced the child, who was sickly, under the spout of a pump in cold weather in January, and pumped the water upon her. The child died shortly after. At the trial, the woman was found guilty by the jury, and Mr. Justice Talfourd said, although it was contrary to the evidence of the medical witness, he entirely agreed with their verdict.

VIII. DEATH FROM HEAT APOPLEXY.

This form of death may arise either from sunstroke, or from abnormally high temperatures in which men have to work hard. While from the former cause it is not unknown in this country, it is much more frequent in other countries where during summer, the climatic conditions approach those of the torrid zone. The annual deaths from this cause in this country may be, on the average, any figure between 100 and 130. Persons who have undergone or are undergoing much fatigue in a humid atmosphere of high temperature are most liable to attack from sunstroke. In such cases, it may present itself in one or other of the following typical forms: (1) The individual is suddenly stricken down insensible, in a state of collapse, with a pale, cold, moist skin, gasping respiration, and with a feeble, rapid pulse. The bodily temperature may be found approximately normal. (2) In the second form, the mode of onset is more gradual, and premonitory symptoms show themselves, such as weakness, weariness, sickness, heat of skin, restlessness, sleeplessness, or drowsiness; and there may be temporary delirium or mania. Then follows a comatose condition, during which the person becomes completely insensible, with a weak, rapid, and irregular pulse, a pale face, and a bodily temperature from 104° to 110° F. The pupils which are at first dilated, become contracted in this stage. Convulsive movements of a limited kind, or general convulsions, may supervene, followed either

[1] *Annales d'Hygiene*, vol. vi. 1831, p. 207.

by death or recovery. Death usually occurs within 48 hours of the seizure; if the patient live over this period, he may be expected to recover. Death, however, happens in not less than 40 per cent. of cases. From the foregoing appearances, therefore, the two forms which sunstroke assumes may be designated shortly as the cardiac or syncopal and the hyperpyrexial or comatose.

Four different hypotheses have been propounded as to the intimate cause of this affection or seizure, viz.:—

1. The Caloric theory.
2. The Chemical ,,
3. The Autotoxic ,,
4. The Microbic ,,

Those who argue in favour of the first affirm that the action of great heat upon the body is to derange the action of the vasomotor and heat-regulating centres of the body. The supporters of the second urge that the seizure is due to the ultra-violet and violet rays of solar light acting chemically upon the brain and nerve-centres in the manner that they are capable of producing dermatitis in the process of skiagraphy. The autotoxic theory is based upon the view that high temperatures, acting upon the body from without, produce profound changes in the blood, in respect that the products of imperfect metabolism of tissues are discharged into that fluid, and these acting upon the vasomotor centres and cardiac ganglia produce the profound constitutional symptoms. Some force is given to this view by the fact that the blood of a victim of insolation has been found to produce toxic effects upon animals. There are, besides, those who believe that the affection, like many other tropical diseases, is due to micro-organisms, because heat-stroke or heat apoplexy is endemic in certain tropical low-lying regions, and, occasionally, takes an epidemic form. Time and research are both needed, however, before the true cause or causes of sunstroke are determined. But heat apoplexy takes place quite apart from the direct rays of the sun, as, for instance, in the case of stokers, engineers, and others whose duties compel them to work in hot, confined places. Many such cases have been put on record. The history of such is something like the following: the person falls down suddenly, either partially, or completely insensible, with a temperature of about 104° F.; this gradually rises until it may reach 107° to 110° F.; the pulse becomes rapid, weak, and almost imperceptible; the breathing is stertorous, and the face, more or less cyanosed. After appropriate treatment, the temperature having been reduced by ice-packs, etc., the person may recover. Such cases usually occur under the circumstances described in hot climates, but they are not unknown even in our own country in men working at furnaces during hot, summer weather. The seizure may also occur in the lower animals.[1]

Post-Mortem Appearances.—In the first type of cases, the cause

[1] For further references, consult—
B. M. J., vol. ii. 1900, p. 764.
,, ,, ,, p. 831.
,, vol. ii. 1896, p. 1568.
,, vol. i. 1897, p. 78.
,, vol. i. 1898, p. 862.

of death being syncope, the appearances found on section of the body will be those of death by syncope. In the second type the death is due to interference with the functions of brain and lungs, therefore the appearances will be those of comato-asphyxia. Both of these have already been fully described.

IX. DEATH FROM MORTAL WOUNDS.

As in the succeeding chapters the whole question of Wounds and Wounding will be fully considered, it is enough at present to state broadly what kinds of wounds, and wounds of what organs of the body, are incompatible with the continuance of life.

A mortal wound may be defined as one which almost immediately after its causation, or within a short period thereafter, causes death; therefore, it usually so interferes with the function of a vital organ of the body, or with the integrity of the general functions of the body, that death is produced.

Generally speaking, wounds of the following organs may be deemed as mortal, viz.:—

1. Of the heart and great blood-vessels—arterial or venous—in which, by penetration of their walls, the course of the circulation is diverted, and their function embarrassed;
2. Of the brain, spinal cord, and medulla oblongata, especially of that part of the cord close to its exit from the brain; owing to injury to important nerve-centres;
3. Severe wounding of the respiratory apparatus;
4. Wounds of the abdominal viscera; of stomach, liver, spleen, kidneys, urinary bladder, intestines; either from primary shock, or hæmorrhage, or from subsequent peritonitis.

But persons may outlive, for days or for longer periods, wounds of the heart. Cases are on record of this kind:—

1. Penetrating wound of the left ventricle, after which the person lived till the fourth day;[1]
2. Wounding of the right ventricle, where person lived for ten years after;[2]
3. Wounding of the left coronary artery and vein and of the muscular substance of heart, where person lived for $4\frac{1}{2}$ months after;[3]
4. Penetrating wound of left auricle which was sutured, where person lived for seventeen days after.[4]

For further reference to this subject, consult Langenbeck's *Archiv.* for 1868,—article by Fischer of Hanover, where are recorded 452 cases of wounds of the heart, of which 72 recovered, 104 died immediately, and 270 lived for periods afterwards varying from one hour to nine months; and Watten, *Deut. med. Wochen.*, Sept. 12, 1901.

In the Phœnix Park assassinations, 1882, the death of Mr. Burke was due to penetration of the left cardiac ventricle, and of Lord

[1] *The Lancet*, vol. ii. Oct. 8, 1881.
[2] *Med. Times and Gazette*, Aug. 3, 1861.
[3] *B. M. J.*, vol. ii. 1896, p. 1440.
[4] Giordani, *Rif. Med.*, Sept. 9, 1898; and *B. M. J.*, vol. ii. 1898, *Sup.*, p. 77.

Frederick Cavendish to hæmorrhage from severance of the right axillary blood-vessels. In the Finchley Tragedy, the right ventricle of the victim was penetrated. We have seen four homicidal deaths which were caused either by penetration of one of the cavities of the heart, the aorta, the pulmonary artery, or the common carotid. In all of these last-mentioned cases, death followed almost immediately.

With respect to wounds of the internal abdominal viscera from applied violence, the fact cannot be too strongly impressed upon the mind that serious wounding may be present without any mark of violence whatever being visible on the abdominal wall externally.

CHAPTER X.

WOUNDS IN THEIR MEDICO-LEGAL RELATIONS.

It may be said generally, that all lesions of the body, internal or external, which are caused by the application of mechanical violence may be designated as wounds. Certain kinds of lesions, however, are neither medically nor legally so designated; for example, the lesion produced by a red-hot poker is, legally and otherwise, more properly called a burn. It will be well, therefore, at the very outset to have a clear conception of what, legally, constitutes a wound. In law, a wound is a breach of continuity of the whole skin, or mucous membrane, or other internal structure of the body; therefore, a mere abrasion of the epidermis or cuticle which does not include the *cutis vera* is not a wound in law. The above definition is not obtained from any Act of Parliament which deals with crimes in which wounding is a prominent feature, but is derived from various decisions of judges given from time to time in cases of wounding. Wounds may be said to include all local alterations of tissues of the body which are caused by violence, whether the cause has been violently applied to the body, or the body to the cause. Notwithstanding the many definitions which have been proffered by various writers, none is better for inclusiveness and comprehensiveness than that given by Wiseman, who was serjeant-surgeon to Charles II.[1] It runs as follows: "A solution of continuity in any part of the body suddenly made by anything that cuts or tears, with a division of the skin. By the word skin, I understand not only the external cutis, but also the inward membranes of the gullet, ventricle, guts, bladder, urethra, and womb, all of which are capable of wounds from sharp instruments, either swallowed or thrust into them." With respect to any external lesion of the skin of the body, it may be said that the presence of bleeding, however slight, may be held to be evidence of wounding, since it is indicative of implication of the true skin. Mere separation of the epidermis is unaccompanied by bleeding.

In a case tried before the Court of Crown Cases Reserved in August, 1838, where, in an assault by a stone bottle, the epidermis only was separated, and although the assaulted person lost the sight of an eye and the hearing of one ear from the effects of the assault, the judges held that to constitute a wound in law, it was necessary that the whole skin should be divided, and therefore, the charge of wounding against the prisoner could not be sustained. The prisoner, consequently, was convicted of common assault only.

[1] "Chirurgical Treatise," book v. chap. i.

The Acts of Parliament which deal with the crime of wounding are the following:—

1 Vict. c. 85.
14 & 15 Vict. c. 100.
24 & 25 Vict. c. 100; sects. 11, 15, and 20.

With respect to lesions producible by violence other than external or internal breaches of continuity of the surface, it was formerly held of simple fractures that such were not wounds, but within the last quarter of a century or thereby, Chief-Justice Denman, Justice Parke, and other Judges have ruled that these fall within the legal definition of a wound. In the case, R. *v.* Smith (8 C. and P., p. 173), where the lower jaw had sustained two simple fractures from a hammer, and where it was argued by counsel that these injuries were not wounds in law, Justice Parke said, "there must be a wounding; but if there be a wound (whether there be effusion of blood or not), it is within the statute whether the wound be external or internal." On the same ruling, a dislocation which is accompanied by wounding of ligaments would be legally considered to be a wound; in fact, it has been so decided. Moreover, bruises in which there is internal breach of continuity of tissues, although there be no external breach of continuity, are reckoned legally as wounds. Consequently, to Wiseman's definition must be added breaches of internal tissues.

WOUNDS IN THEIR RELATION TO DANGER TO LIFE.

In order to convey some meaning to the minds of others with respect to the relative gravity of wounds, certain qualifying terms have been applied; as, for example, *slight*, *dangerous*, *mortal*. It is very necessary that medical witnesses, especially, ought to have clear and definite conceptions of what ought to be meant by these terms.

A *slight* wound ought to mean one in which the lesion is neither extensive nor serious, which heals rapidly, and which leaves no deformity behind it; a *dangerous* wound, one that is either extensive or serious with relation to the organ or part wounded, which presents surgical difficulty in its cure, but which is not attended usually by fatal consequences; and a *mortal* wound, one which almost immediately after its causation, or within a short time thereafter, causes death. A wound ought to be deemed *dangerous to life* only when the danger is imminent; as, for example, where a large artery is wounded, since in the absence of skilled assistance death from hæmorrhage would ensue. The term ought not to designate a wound which, originally simple in character, becomes dangerous from superinduced disease, as tetanus, erysipelas, or septicæmia, even although from such secondary complication the wounded person may die. "Whosoever shall, by any means whatsoever, wound or cause any grievous bodily harm to a person" shall be guilty of crime. So run the words of the statute. What then is meant, or ought to be meant, by the words "*grievous bodily harm*"? It is difficult to put in terms what is meant in law by these words; but it may be said that grievous bodily harm is inflicted when the injury causes some measure of pain or incon-

venience, or both, to the assaulted or injured person, and so prejudices, for the time being at least, the bodily health.

At the Leeds Assizes, February 1883, before Mr. Justice Day, the Corporation of Sheffield prosecuted a midwife for having recklessly spread syphilis among certain women whom she had delivered, and from them to their husbands. The charge against her was that on a certain date she "unlawfully and maliciously did inflict grievous bodily harm on" the persons named "against the form of the statute in such case made and provided, and against the peace of our Lady the Queen, her crown, and dignity." The prosecution brought forward three groups of persons infected by the defendant,—two married women, one infant, and the husbands of the women. It appeared that forty-five persons in all were infected either directly or indirectly by the defendant. She was found guilty on all the counts, and was sentenced to twelve months' hard labour.[1]

WOUNDS WITH RELATION TO CULPABILITY.

If a wound be inflicted to remedy which surgical operative procedure is required, and from which surgical procedure, *skilfully applied*, the assaulted or injured person dies, the person who caused the wound is chargeable either with the crime of murder, or culpable homicide or manslaughter, these last being the terms employed in Scots and English criminal law respectively to designate the same crime. In such circumstances, however, it would be competent for counsel for the prisoner to lead evidence, if he thought fit, to show that the treatment was not skilfully applied. The law is very liberal in its interpretation of the meaning of skilful treatment. If the person who applied the treatment is a registered medical practitioner, if it has been applied for the purpose of cure and in good faith, even if the treatment in itself was improper, the assaulted person would be considered to have been skilfully treated, and the assailant chargeable with the major crime; provided that it was not proved in evidence that the original injury was not in itself dangerous to life, or that the improper treatment *per se* was not the cause of death. The law demands only reasonably skilled treatment, such as ought to be able to be given by any ordinary registered practitioner, for the simple reason that the standard and means of treatment of a rural practitioner ought not to be gauged by those of an expert hospital surgeon. It is because of the alleged absence of reasonable skill, or the non-exercise of it, that actions of mal-praxis are not infrequently laid against medical men.

It is not expected that medical men should be familiar with the circumstances which constitute wounding in one case to be justifiable, and in another, criminal. If, for example, two persons agree to commit suicide together by the same agency, and one die and the other survive, the survivor is chargeable with the crime of murder; whereas, on the other hand, if a fatal wound be inflicted in self-defence when the inflictor was under just bodily fear of death from an assailant, provided it was not inflicted in a duel, the deed would be held in law

[1] *B. M. J.*, vol. i. 1883, p. 335.

to be justifiable homicide or manslaughter. It is a crime to attempt to commit suicide by wounding or in any other way, unless the person be proved to be of unsound mind at the time. Suicides who recover after attempts to destroy themselves, if sane, are chargeable with the crime of attempted *felo de se* or self-destruction.

If a wound be the cause of death within a year and a day after the date of its infliction, the person who maliciously inflicted it may be charged with the crime of culpable homicide. In civil suits also, within a like period, an action would lie. Under the Employers' Liability Act of 1897, due notice must be given to the employer of the occurrence of an accident, and if an action be raised, that must be done within six months after the date of the accident. In cases where the employer or the person by whom the employer is entitled to be indemnified requires it, the injured workman shall, from time to time, submit himself for examination by a registered medical practitioner appointed and paid by the employer or indemnifier. If the workman objects to or is dissatisfied with such examination, he may elect to be examined by one of the medical men in his locality appointed for the purpose by the Secretary of State. The report of that practitioner shall be deemed conclusive.

Mal-praxis is, as the name implies, failure in the exercise of reasonable skill or care on the part of a medical practitioner. As it is of the highest importance that the lives of the citizens should be conserved, if possible, when menaced by disease or by the infliction of injury, most civilised States enact that those who are to pursue the profession of medicine and surgery should be duly educated and examined before being adjudged fit to have their names placed upon a register as being considered duly qualified by the State. The public who entrust themselves to the skill and care of such registered practitioners are, therefore, entitled to demand and to expect from them the exercise of reasonable skill and care. There is no let or hindrance in British law to any person, however unfit, professing the treatment and cure of disease, so long as such person does not falsely pretend by the illegitimate use of titles commonly used in this country by those who are legally registered, or in other way, that he is so qualified and registered. But the law will more narrowly scan the actions of such persons, since, obviously, deaths may arise in the course of their practice attributable to their lack of knowledge, or to improper treatment. Further, illegitimate practitioners are not entitled by law to sue in law-courts for fees for services rendered, since they are not upon the legal register of those who are recognised as qualified to render medical or surgical services.

What is meant by the terms "reasonable skill" and "reasonable care" with reference to the practice of medicine and surgery? These are difficult to define. Obviously there must be in theory a minimum in respect of both, failure to satisfy which would inculpate the practitioner. The question whether or not mal-praxis has existed must depend upon the facts of each case; but from a purview of many cases, it is clear that gross ignorance of treatment, or gross carelessness in the conduct of a case, is necessary for a conviction of mal-praxis. It is obvious that the term "reasonable" must be applied relatively. It cannot be expected that a rural practitioner should possess the surgical resources of a hospital surgeon; therefore, all that the law demands is the exercise of such an amount of skill as ought to be possessed by every one who has received the statutory education and who has passed the statutory examinations. It is laid down by the law that a medical practitioner is not responsible where, for example, in the *bonâ fide* treatment of a case a drug has been administered to expedite a cure or to convey relief, but which, contrary to ordinary experience, has acted disastrously. Sir Matthew Hale[1] declares that "if a physician gives a person a potion, without

[1] "Pleas of Crown," i. p. 429.

any intent of doing him bodily hurt, but with an intent to cure or prevent disease, and, contrary to the expectation of the physician it kills him, this is no homicide; and the like of a chirurgeon." Chief Baron Pollock (R. *v.* Crick, 1 F. and F., p. 519), said: "It would be most fatal to the efficiency of the medical profession if no one could administer medicine without a halter round his neck;" and in the case of R. *v.* St. John Long, Mr. Justice Parke said to the jury, "It would be a dreadful thing if a man were to be called in question criminally whenever he happened to mis-carry in his practice." Whether or not reasonable skill or reasonable care has been exercised must be determined by the evidence in each individual case. Cases on the border-line might be cited in large numbers. It would be a question for a jury to determine whether, for example, in a case of delivery of a child, the perinœum of the mother being torn some inches into the rectum, and where no surgical remedial procedure was adopted, nor, indeed, any intimation of the occurrence was made, with the result that the woman thereafter suffered from incontinence of fæces, the medical practitioner was guilty or not of mal-praxis. It would, doubtless, be probably argued that rupture of the perinœum is not an uncommon accident in such cases, but there would be difficulty in explaining why the lesion produced was not surgically treated by the practitioner, and why he had not called for assistance if he himself were unable to cope with the lesion. The *culpa* in such a case would not lie in the production of the lesion but in the gross negligence exhibited in its treatment. In criminal cases, great carelessness or gross ignorance must be proved. At the Calcutta Criminal Sessions, April, 1884, a medical practitioner was tried and found guilty of having caused the death of a child by administering an enema of carbolic acid in water for worms. The enema was proved to contain 200 drops of Calvert's No. 2 acid. The reprehensible ignorance displayed in this case merited the punishment which was awarded. It has been our duty to advise the Crown regarding cases of alleged mal-praxis. In one case in which the information was laid by one practitioner against another, it was alleged that owing to the culpable carelessness of the accused, enormous bed-sores had formed on the body of the patient. Examination of the patient and other inquiries revealed that the sufferer was a paraplegic and that the nursing had not been carried out according to instructions. The charge, therefore, broke down. In another, a practitioner was accused of the death of a woman after her delivery, in respect that he had failed to give her the usual and necessary care and attention. Post-mortem examination of the body of the woman showed that death resulted from septicæmia, due in all probability to absorption of septic matter by a small breach in the perinœum—a condition which, occasionally, arises even with the exercise of the greatest care. The charge, therefore, was never formulated. In 1893, at the Central Criminal Court, London, certain "Indian" oculists were charged with alleged conspiracy to obtain money by false pretences with intent to defraud. It was shown in evidence by eminent oculists that the operations performed by these persons were not only antiquated and barbarous, but were also useless and unnecessary for the purpose of cure. On the questions being put to the jury whether they thought the operations performed were as above described, and whether there was intent to defraud, a verdict of not guilty was returned. In the case of R. *v.* Wight, tried at the same Court in November 1895, the accused, being a qualified practitioner, was charged with having caused the death of a woman while delivering her with forceps, he being at the time under the influence of alcohol. It was shown in evidence, however, that the cause of his condition was not alcohol, but chloral hydrate. He was found guilty and sentenced to three months' imprisonment. In delivering sentence, Mr. Justice Wright stated that had alcohol been proved to be the cause of the prisoner's condition, a much more severe sentence would have been passed. The comments of the Judge indicated very properly that no medical man was entitled to practise his profession while under the influence of any drug or other narcotic substance. Charges of mal-praxis are common against practitioners in civil actions. They are usually founded upon badly-mended fractures, or injuries with division of nerves followed by loss of power. But some of the charges are unusual. In June, 1899, in the case of Smith *v.* Burns, the defendant was sued for damages in respect that through negligence or ignorance he had opened an aneurysm of the leg in mistake for an abscess. After trial, the jury returned a verdict for the defendant. The Judge in his charge to the jury said that a

medical man was not responsible for an error of judgment, and that the question they had to decide was, whether the error was one which any reasonably instructed surgeon, using due care and skill, would have made.[1] The law relative to the responsibility of a medical practitioner may, in short, be summed up in the words of the Lord Chief-Justice in the action of Anderson and Another *v.* Moeller which was tried in May, 1900, viz.: "A medical man was bound to bring to the discharge of his duty only reasonable care, skill, and knowledge."

The Characters of Wounds. In cases of wounding it is important that the character of the wound, in relation to the class of weapon by which it was produced, should be properly designated. For that purpose wounds have been classified as follows, viz.:—

(*a*) Incised Wounds;
(*b*) Lacerated and Contused Wounds;
(*c*) Punctured Wounds;
(*d*) Contusions;
(*e*) Gunshot Wounds.

FIG. 41.—Photograph of Incised Wound in Wall of Chest produced by Stabbing. The weapon entered the Aorta. (Author.)

I. Incised Wounds.—In surgical language, an incised wound is defined as "a solution of continuity without loss of substance." Such wounds are produced by sharp-edged instruments, as knives, scissors, glass, or earthenware. The instrument may be used either:—

(*a*) As a wedge as in stabbing where the sharp point of the weapon is driven into the tissues, thus separating them as a wedge does a piece of wood (Fig. 41); or,

(*b*) After the manner of a saw; where the tissues are divided by the microscopically fine serrated edge of the cutting instrument held in the fashion of a pen, which serrations are the more apparent the blunter the edge of the weapon. To observe this serration of edge, it is only necessary to examine the edge with a good hand-lens against a black background.

[1] *B. M. J.*, vol. ii. 1899, p. 60.

The *Form* of an incised wound depends, in some measure, upon the mode of use of the sharp instrument. When it is used as a wedge, the form of the wound is fusiform or spindle-shape, due to the greater retraction of the tissues in the middle of the breach of continuity; but when it is used as a saw, the spindle-shape character may be more or less lost in the linear. This gaping or retraction depends, also, as to its amount upon the elasticity of the particular tissues severed, and upon the direction of the wound; for example, a wound made in the plane of the muscular fibre gapes less than one made at right angles to the plane; and the same is true when a limb is extended than when flexed.

The *Edges* of the incised wound are clean-cut, regular, and well-defined, begin abruptly, bulge in the centre, and terminate gradually. An incised wound usually bleeds much more, things being equal, than do other kinds of wounds. With relation to the class of weapon which produces them, incised wounds are broader than the edge of the cutting instrument (in other words, broader than the thickness of the blade), and their length is usually somewhat less than the breadth of the instrument. This rule, however, applies more to wounds produced by stabbing—where the instrument is used as a wedge—than to those where it is used after the manner of a saw. Stabs which partake of the character of an incised-punctured wound are of distinct fusiform shape, and are generally less in length than the breadth of the instrument, because of the contractility of the tissues. Where a penetrating incised wound has passed through a limb, the wound of exit is likely to be smaller than that of entrance, because of the common tapering character of instruments capable of producing wounds of such depth. It may happen, however, that by reason of uniformity of breadth of blade, exit and entrance wounds may be indistinguishable.

FIG. 42.—Case of Homicidal Cut throat. (*Vide* also Fig. 53.) The above illustration is taken from the left side of body. The upper wound, as shown, was serrated at its termination on the right. The main wound on the neck ran from nearly the extremity of one clavicle to the extremity of the other, and at its endings was only half an inch higher than the level of clavicles. It severed the main blood-vessels, muscles of neck, and trachea.

But in certain circumstances and in certain situations on the body, wounds may be produced by a blunt instrument which may simulate

very closely the appearances of an incised wound produced by a shar instrument. Such wounds are usually found over bony prominences as the shin, external process of the frontal bone, superciliary ridge orbital ridge, zygomatic process, line of lower jaw, occipital eminence etc., but they may even be found on a flat bony surface, as the forehead Where such a wound exposes hair-bulbs in its lips, it is ordinaril possible by examining these carefully with a good hand-lens to sa whether they have been crushed or cut, or are entire, and thu to establish whether the wound was caused by a sharp or blunt in strument.

II. Lacerated Wounds.—These are caused by forcible contact wit blunt instruments. They are usually ragged, or torn, or irregular as t their edges, and do not, generally, correspond in shape or in size to th instrument which has produced them. If the violence has not entirel severed the skin tissues, on gentle separation of the edges of the wound little bridges of connective tissue, or nerve fibrils, will probably b discovered stretching across the gap and binding the edges. Thes will be absent, however, where the skin and subjacent tissues ar wholly divided. As a rule, lacerated wounds are accompanied b more or less contusion of their edges; hence the edges are generall swollen. The amount of contusion found will depend entirely upo the amount and incidence of the concussive force, and the resistanc of the tissues; for example, where there is a bony background, as o the scalp and elsewhere on the body, contusion is likely to be mor marked than where the subjacent tissues are softer, and, therefore, les resistant. Lacerated wounds may or may not bleed much. Thi depends upon whether the blood-vessels are wholly, or only parti ally, severed; in the latter case, because of the inability of th coats of the vessels to retract within their sheaths, there is usuall much bleeding, but in the former the crushed coats at the severed end seal up the vessels, and, consequently, there is but little hæmorrhage In their production, there is usually loss of substance, and, therefore they heal by granulation, suppuration accompanying the healing pro cess; thus they leave a permanent scar in their train.

III. Punctured Wounds.—These are sometimes termed penetratin wounds, because in their course the deeper tissues, or a natural cavit of the body, are penetrated. They may be produced by pointe weapons, the point being either sharp, or comparatively blunt, i which latter case more force is necessary to effect the same degree o penetration than where the point is sharp. In the case where th instrument is sharp-pointed, they ought to be designated punctured incised, and where blunt-pointed, punctured-lacerated wounds; be cause of the physical characters of the edges. A punctured woun differs from an incised or lacerated wound in that its depth is greate than its length or breadth, characters which indicate the use of pointed instrument. The use of the word "penetrating" ought strictl to designate a wound which, passing through the tissues, enters cavity of the body, such as thorax or abdomen. (Fig. 43.)

IV. Contusions.—Some degree of contusion is often found in o around the edges of lacerated wounds, and, in rarer instances, aroun the edges of incised wounds. This is due to the use of a blunt instru

ment in the former, and, in the latter, to the use of a short-bladed weapon which is driven violently up to the hilt. The term *contused wound* ought to be abolished from medico-legal nomenclature, since wounds are either caused by sharp or by blunt instruments. If the edges of an incised or a lacerated wound be accompanied by contusion, the fact ought to be noted, but the nature of the wound itself ought to determine the class to which it belongs, and to indicate the class of weapon which has produced it; in short, the term "incised" ought to be used only to signify a wound caused by a cutting instrument, and the term "lacerated," to a wound caused by a blunt instrument, while the element of contusion when found, ought to be treated as merely an incidental fact, indicative of the amount of violence used with relation to the part struck. There would, therefore, be left the general term *contusions* which should be used to denominate bruises, in which the wounding is not on the surface of the skin but in the substance of the true skin and the subcutaneous cellular tissue, in which the blood is effused and lodged, and which causes the condition called ecchymosis. Contusions may vary in size from those accompanying a "black eye" to extensive swellings accompanied by much subcutaneous extravasation of blood. A contusion, therefore, may be defined as a breach of continuity of the structure of the true skin or subjacent tissues without loss of external continuity, caused by the application of a blunt instrument. The extent of rupture of subcutaneous vessels depends, in normal circumstances, upon two factors, mainly, viz.: (*a*) the severity of the concussive force; and (*b*) the vascularity of the part struck. The first factor is obvious; the second may be illustrated by the enormous swellings in the vulva which usually result from a degree of violence, which, if applied to the buttock or the head, would have produced less marked results. The extravasated blood in the subcutaneous tissues constitutes the ecchymosis, and is the cause of the resulting discoloration. The point of time at which the discoloration appears varies in different circumstances, and its colour-tone depends upon the amount of blood extravasated and its distance from the surface of the skin. When it does appear, however, it tends to deepen until the extravasated blood ceases to be effused; then the part appears swollen. Later, the blood separates into serum and coagulum, the serum becomes absorbed, and as the absorption proceeds, the swelling becomes reduced; gradually, the clot also becomes absorbed, during which process the colour-tone undergoes change in gradation of colour—from violet to blue, from blue to green, from green to yellow, until, at last, the skin assumes its normal hue. Only in a very general way, and

FIG. 43.—Photograph of Incised Wound in Wall of Chest produced by Stabbing.

after consideration of all the circumstances, can the period at which the original violence was applied be inferred from the colour-tone of the contusion; but, approximately, it may be said of an average-sized bruise, that the blue colour appears about the 3rd day, the greenish from the 5th to the 7th day, the yellowish, from the 8th to the 10th, while the normal colour will probably be restored to the part between the 13th and 18th day. While it is generally true that the change of colour is first apparent at the periphery of the bruise, since there the layer of extravasated blood is usually thinnest and the effects of absorption are, therefore, most quickly perceptible, it ought to be noted that in certain bruises, on the other hand, the change is first noticeable in the centre; this is specially true of extravasations in the neighbourhood of varicose veins. The foregoing is, however, only true of comparatively superficial bruises; when ecchymoses are more deeply seated, the colour takes some time to appear externally. Further, the part where the external discoloration appears does not necessarily, in the case of deep-seated extravasations, indicate the seat of the application of the violence, because, owing to the disposition of planes of areolar tissue in limbs and other parts of the body, the discoloration may show itself either above or below the part struck. Velpeau has shown, for example, that in the armpit the discoloration appears below the part injured, whereas in the iliac and hypogastric regions it extends above the part struck; and so, also, in respect of bruises in the vicinity of the knee and shoulder joints.

But the quantity of extravasated blood is sometimes determined by abnormal conditions of the body; in other words, the amount of discoloration present may be out of all proportion to the amount of violence used. In scrofulous, scorbutic, purpuric, and hæmophilic conditions, this is particularly true; and if attention be not given to the presence or absence of these factors in estimating from the extent of discoloration the amount of violence offered, very serious mistakes of judgment will be made, and very erroneous opinions offered. In all cases, therefore, in which extensive bruises are found, the presence or absence of the foregoing predisposing factors ought to be considered, before opinion is finally offered.

While it is probably true in the large bulk of cases that ecchymoses are the result of applied violence, it ought not to be forgotten that they may present themselves without the application of any external violence whatever—in the legal sense. This fact has been known for many years, as it has been noticed in books on whooping-cough, in which affection, by reason of the explosive cough, ecchymosis is by no means infrequently seen in the conjunctivæ, and, less frequently, in the face and neck. But the phenomenon received special attention from the pen of Lediard of Carlisle[1] in a paper on "Ecchymoses from Natural Causes." There cannot be any doubt whatever that in cases where from any cause embarrassment of breathing and tension of the circulatory system are united, these spontaneous extravasations of blood are likely to result, as, for example, in asphyxia from any cause. Their importance arises from the fact that they might be mistaken for extravasations due to violence, and thus, under certain

[1] *Med. Chirurg. Trans.*, vol. lxxix.

circumstances, an innocent person might be convicted of assault where no violence had been offered.

The following cases illustrate the extent of such ecchymoses arising spontaneously :—

1. Cabadé[1] reported at a French Congress the case of a carpenter, aged 40, free from cardiac and vascular lesions, who, after an attack of epilepsy which occurred while he lay in bed, developed in the course of the day subcutaneous extravasations of blood which involved the chest from the sub-clavicular region to the base of the thorax on the right side, and to the crest of the ilium on the left side, the arms and shoulders being also enormously swollen and discoloured. At the ecchymotic places, the skin was hard, raised, and dense, and great pain was complained of in arms and shoulders, due, it was believed by the reporter, to compression of the brachial plexus by the extravasated blood. The ecchymoses underwent the usual changes of colour, and they took fully two months before finally disappearing.

2. A young woman, aged 21, while standing speaking to some friends, suddenly fell, striking her head against a wall as she fell. Upon being examined by a medical man there were subcutaneous extravasations of blood over the head and neck, subconjunctival extravasation in both eyes, and there was slight bleeding from the right nostril and left ear. The subcutaneous extravasation ended abruptly about the level of the upper border of the thyroid cartilage. It was believed that the onset of the extravasation was caused by an increased tightness, during the fit, of an already tight collar, because the line of extravasation corresponded with the upper level of the collar. The ecchymosis disappeared after a few weeks.[2]

3. Etienne communicated two cases to the Société de Neurologie of Paris[3]; In the first, there suddenly appeared on each arm of a girl who was 13 years of age, a long strip of ecchymosis, which disappeared, only, however, to be succeeded by other ecchymoses during a period of six weeks. She also suffered from epistaxis. In the second, a woman aged 32, on awaking from sleep, found a strip of ecchymosis measuring three inches long by one-third of an inch wide on the right shoulder, with a few smaller parallel strips over the clavicle. This woman had a purpuric disposition.

In view of the foregoing, therefore, it is not difficult to conceive that, if these appearances had been found upon dead bodies, very different conclusions as to their causation might, probably, have been arrived at.

V. Gunshot Wounds.—Wounds produced by projectiles which penetrate are likely to be more or less contused and lacerated in character. Where the missile, however, penetrates at high velocity, is of a long, pointed shape, and is composed at its point of hard metal, the wound may only appear as a slit, straight or curved, without much or any evidence of contusion or laceration, and it may heal by first intention. Where the missile strikes the body but does not penetrate the tissues, the lesion will be of the nature of a contusion. Usually, unless important vessels are severed in the course of the traject of the missile, such wounds bleed but little. (Fig. 44.) Much has been written regarding the appearances of the wounds of entrance and exit respectively, where the bullet traverses the trunk or a limb of the body; but too much reliance must not be placed upon the statement that the wound of entrance is usually smaller than that of exit, or that the wound of entrance has depressed or inverted, and that of exit, everted edges. It is obvious that these appearances must depend upon the exact conditions of the individual case. Some of the conditions with

[1] *The Lancet*, vol. ii. 1892, October 8.
[2] *B. M. J.*, vol. i. 1901, p. 338.
[3] Ibid., 1900, Sup. p. 65.

respect to the person which may affect these appearances are: (1) the part of the body struck by the missile, and (2) the distance into or through the body which the missile has traversed; and the conditions with respect to the missile itself, are: (1) the shape and composition of the missile; (2) its velocity at the moment of impact; and (3) the amount of obstruction experienced by the missile in its traject through the tissues. The experiences of the South African and other recent wars clearly indicate, with respect to modern projectiles at least, that our views on gunshot wounds must be recast. The correspondent of one of the medical journals[1] states of the wounds produced by the Mauser bullet, that "the aperture of entrance seldom shows any bruising of surrounding tissue; frequently it has been difficult to locate it, for where the skin is dense and elastic there is seldom any bleeding. There is never any inversion of the edges, which are sometimes circular in form, and sometimes triangular, like a leech-bite. The aperture of exit, where the bullet has not been distorted, is seldom any larger than that of entrance; there is no bruising of surrounding tissue, and no eversion of the edges; bleeding varies, of course, in accordance with the proximity of large, medium, or small blood-vessels in the track, but in the vast majority of cases it is slight." The late Sir William MacCormac, quoted by Sir William Stokes,[2] says, "I saw a large number of injuries inflicted by the Mauser bullet, which is remarkable for the

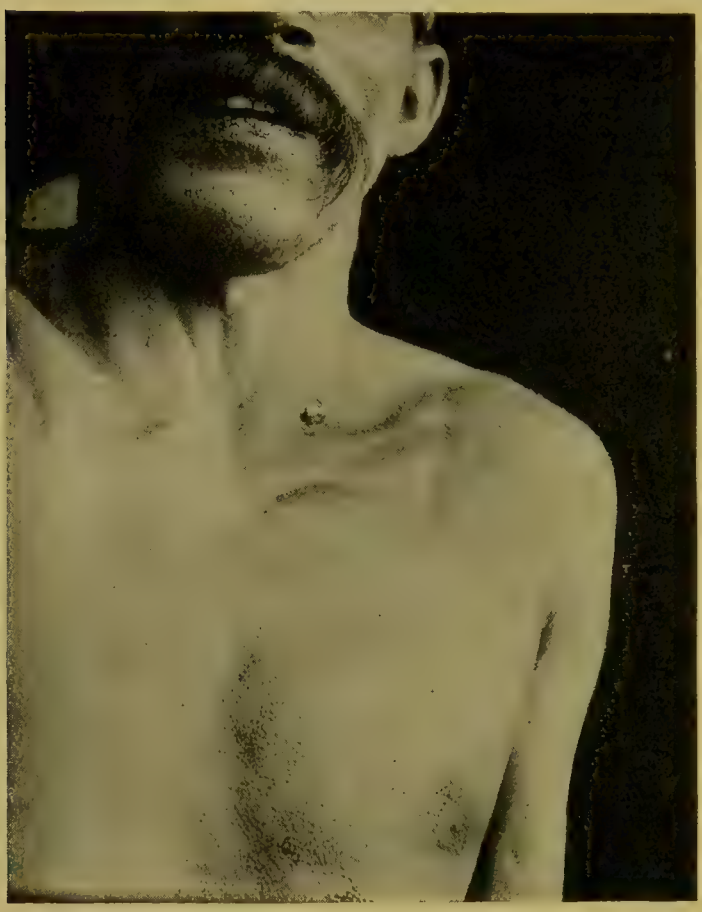

FIG. 44.—Fatal Revolver Bullet Wound of Neck. The missile passed through the tissues of the neck without wounding any important blood-vessel or nerve-trunk, but penetrated the apex of the left lung. The left pleural cavity contained about 36 ounces of fluid and clotted blood and bloody liquid. The bullet was found between second and third ribs, which were not fractured, close to vertebral column. (Author.)

[1] *The Physician and Surgeon*, 1900, p. 49.
[2] *B. M. J.*, vol. i. 1900, p. 1453.

small external wound it produces. In three-fourths, if not a larger proportion, it was impossible to tell the exit from the entrance wound, they were so similar in appearance." This is less to be wondered at when the size of missile is considered. The calibre of the Mauser rifle is only 7 m.m., or 0·275 of an inch, and that of the Lee-Metford, 7·7 m.m., or 0·303 of an inch, while the diameter of the bullet of the former, is 0·284 inch, and of the latter, 0·311 inch; in other words, the bullet is rather larger than the rifle-calibre. Such bullets, when the impact with the body is at high velocity, perforate bones just as if a gimlet had been passed through them. Mr. Treves,[1] by reason of his South African observations, traverses three statements of the books respecting gunshot wounds: (1) that the entrance and exit wounds decrease in size as the range increases; (2) that a circular and small wound of exit is rare when a

FIG. 45.—Fatal Gunshot Wound of Brain. The missile—a soft, round, lead bullet—entered the malar bone at its junction with the zygomatic process and produced much fracturing of bone. The other figure on the right is a Fracture of the Parietal Bone found on the body of a newly-born child which had fully respired. (Author.)

bone is hit, as he has seen the very smallest hole after the bullet has actually passed through a bone; (3) that shock is commonly present. From multiple observations by various surgeons in the war, recovery was marvellously rapid even in cases where the missile, from the line of its traject, must have traversed the most important organs of the body, and even the heart itself. It is very apparent, then, from the foregoing, that the small missiles must have passed through the body without any alteration in shape. Where expanding, grooved, soft-nosed, Dum-dum, or ground-nosed bullets are used, the wounds produced are of a more extensive, more ragged, and more destructive character.[2] The wounds from fragments of shell are, also, of this extensive and destructive nature. (Fig. 45.)

[1] *B. M. J.*, vol. i. 1900, p. 1156. [2] Ibid., p. 665.

Regarding the healing of wounds produced by missiles from small-bore rifles, Mr. Makins states that in the South African war they "heal in a few days with no surrounding induration or œdema."[1]

In projectile wounds of the cranium, where the bullet has entered from without inwards, the wound of entrance may usually be distinguished by the bevelling of the inner table of the bone—that is, there is more bone driven off the inner table than the outer,—and the exit wound, when the bullet has passed from within outwards, as in a shot fired into the roof of the mouth, by the bevelling of the outer table. This is due to the fact that the cranial bones are composed of two plates with a layer of more cancellous bone—the diploë—intervening. But even here, too hard and fast a line cannot be drawn.

But charges of small-shot may, under certain circumstances, produce wounds which simulate more or less closely those produced by a single missile; as when the charge enters the body at short range. Such, however, will be more fully considered when the question of accident, suicide, or homicide is discussed.

In dealing with gunshot wounds, when the question arises whether, in the case of two wounds being found on the body not corresponding to the likely line of traject, we are dealing with wounds produced by one, or by two missiles, it is important to remember that the course of a projectile in the body may be very erratic. Such unusual courses have been often recorded, but the following recent case will exemplify this point.[2]

"The bullet first produced a comminuted fracture of the left thumb, which was in contact with the chest wall at the time, then entered the chest 2 inches above and the like distance to the inner side of the left nipple, passed upwards and outwards along the rib, was deflected downward by the anterior edge of the left scapula, and continued on this course until it reached the crest of the left ilium; it then passed nearly vertically upwards to the wound of exit which was situated about 1½ inches below and in a line with the inferior angle of the left scapula. The pleura was wounded *en route*. After leaving the body of this patient it tore a large piece from the pectoral muscles of a child aged five, who was probably clinging to the old man from behind. There were no signs of any injury to the lung itself, and the case did well."

Cases have also been recorded where, in attempted suicide by a revolver, the muzzle of the weapon being applied tightly against the skin of the body, no further mischief than slight contusion has resulted. It would appear as if the only explanation of this is, that the column of air in the barrel between the pistol-charge and the skin acts as a cushion or buffer by reason of its inexpansibility, and thus the explosive force of the charge being expended in overcoming this resistance, the missile falls harmlessly to the ground.

In view, therefore, of all the foregoing circumstances, it is only wise that no opinion should be offered regarding the nature and course of the missile, unless and until the whole facts of the case have been carefully weighed.

Injuries without External Marks of Violence.—In addition to

[1] *Vide* Dent, *B. M. J.*, vol. i. April 21, 1900; ibid., vol. ii. 1899, p. 1809.
[2] Ibid., vol. i. 1897, p. 1219.

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The June number of the *Indian Medical Gazette* is entirely devoted to medico-legal subjects, and among other interesting papers is one on ruptured spleen by Lieutenant-Colonel D. G. Crawford, I.M.S., based on the records of no fewer than 304 cases, which he has collected from the medico-legal records of eleven districts of Bengal in which he served; a few had been under his own observation. This paper is full of detailed tables illustrating various points, and it comes at an opportune time, as recently a learned judge remarked that ruptured spleen as a cause of death after slight injury was too thin and altogether exploded an idea to be set up as a defence in cases of the deaths of natives who had received slight blows at the hands of Europeans. The total number of reports gone through was 9,876, showing a percentage of 3.08 cases of ruptured spleen. In the very malarious district of Hughli the percentage was 7.56 of the bodies sent in by the police for medico-legal examination, while on the other hand in the less malarious districts of Bihar the percentage of ruptured spleen was less than the average of the whole of the districts, so that it may be said that rupture of this organ is more common in the most malarious districts and vice versa. This is in accordance with the fact that in only 8 out of the whole 304 cases was the organ noted as being of normal size, the well-known relationship between the frequency of enlargement of this organ and the incidence of malaria being once more exemplified. In just over one-third of the cases blows with a heavy stick or other such implement was the cause given, while in one-sixth blows with the fists or kicks produced the injury, falls accounted for 22 cases, while 17 had been run over by carts or carriages. The inner surface of the organ was most frequently ruptured. In another paper in the same number a case of spontaneous rupture of the spleen is recorded.

The seasonal decline of plague which had begun to show itself at the end of April, has continued during the last two months to a marked degree, the last weekly total having been only 1,684, against about 800 in the same week of last year. The Punjab is responsible for no fewer than 1,026 of the deaths, the Bombay Presidency for 311, and Madras for 170, no other

the wounds which are caused by different classes of instruments, it is necessary to be forewarned of the fact that violence may be applied to the abdomen whereby serious lesions of internal organs are produced, without leaving any external trace of its application upon the abdominal wall. This fact was forced upon our attention by a case which occurred in 1879, and which we then recorded.[1] The facts, shortly stated, were these: A young blacksmith while engaged in shoeing a horse, was violently kicked in the abdomen by the unshod hoof of the animal. He suffered at the time from severe abdominal pain, took to his bed, and died two days after. No trace of injury was seen on the abdominal wall at any time between receipt of the kick and the post-mortem examination which we made on the day after the death. The dissection revealed general peritonitis, and in the small intestine, corresponding in position to the region of the kick, was found a knuckle of intestine, much inflamed, in the centre of which was a lacerated wound one inch in length, and opening into the lumen of the bowel. The record of this case called forth other cases; one in which there was "fatal rupture of colon, without external bruising," by Dr. Haining of Chester; a second, in which the jejunum was ruptured from a blow, with no trace of external or internal bruising of abdominal wall; and a third, "rupture of the jejunum, without abdominal contusion." Since that time, we have found like lesions in three cases, the subject of medico-legal inquiry, in all of which fatal intestinal injuries had been produced without any external or internal mark of injury upon the abdominal wall; and in a fourth, in which rupture of the liver at the junction of right and left lobes was produced. Dr. Davies,[2] and Mr. Bryant,[3] have also recorded similar observations.

Data from which the kind of Instrument used may be inferred from the Nature of the Wound.—The forms of wounds are very variable, and, frequently, their shape bears no relationship to the kind of weapon which has caused them. At the same time, there are certain well-established data which, if found, are of great assistance in arriving at a conclusion.

I. Wounds with sharply-defined edges — clean cut — are, in the great bulk of cases, the result of forcible contact with a sharp instrument. The rare exceptions are those which are produced over bony ridges or prominences by forcible contact with a blunt instrument. Differential diagnosis in these can be established by careful examination of the condition of the hair-bulbs of the cut edges with a hand lens.

(*a*) When a sharp-pointed, edged instrument is applied perpendicularly to the body, the wound is less in length than the breadth of the instrument, and broader than the thickness of the blade.

(*b*) When the same instrument enters the body obliquely, the edges of the wound appear unequal, one edge appearing to be straight and the other curved, and, not infrequently, owing to the bevelled shape of the wound, beads of subcutaneous fat appear between the lips.

[1] *B. M. J.*, vol. ii. 1879, p. 652.
[2] Ibid., vol. i. 1899, p. 469.
[3] *The Lancet*, vol. i. 1896, p. 87.

(*c*) Lesions produced by glass and earthenware present different appearances. Some closely simulate wounds by an instrument of the dagger type, others, wounds by instruments used after the manner of a saw. One very interesting case of the former type, in our experience, was as follows:—

Two men were fighting late at night. One was a railway servant on his way home from work, the other a barber who left his shop to engage in the fight. The former fell, shouting out that he had been stabbed by scissors. He was bleeding profusely from a wound over the hip, which measured 1½ inches in length and 2½ inches in depth. From careful examination of the wound, we concluded that the wound was not caused by scissors, but, probably, by glass or earthenware. On further inquiry, it appeared that the wounded man, before he began to fight, had been carrying a small, empty, earthenware jar in which he conveyed his liquid food to his work, and had set it down beside where he stood. A careful search of the scene of the fight was then made by a criminal officer, and a broken jar was found, of which all the remains could be fitted together, a triangular piece being still amissing, and which, moreover, corresponded in size to that of the wound. When daylight came, further search was made, and, some yards from where the man fell wounded, the missing piece, covered with blood, was found. This solved the problem.

In cases of wounds of the scalp from glass or crockery, small shivers of these substances may be found either in the tissues, or even embedded in the bone itself, from which the nature of the offending weapon can be diagnosed. We have found this on many occasions.

There is one especial peculiarity of glass wounds which we believe to be characteristic solely of glass, viz.: a parallelism of the edges of the wound, with a sudden inequality or tapering, sometimes to the form of a mere scratch, at one or other extremity. This we believe to be due to the unequal fracture-surface so often seen in broken glass.

(*d*) Upon occasion, wounds consisting of a series of small punctures, situated at equidistant points from one another, may be seen. These are the result of violence from the strong teeth of a comb which is worn by a certain low class of women of the town, for keeping up the hair at the back of the head, and which is a favourite weapon of offence and defence.

II. Wounds with ill-defined, irregular, or ragged edges, which may be connected by bridges of connective tissue or nerve-filaments, are always caused by forcible contact with a blunt instrument. When found on the scalp, whole or crushed hair-bulbs may be picked out of the edges of the wound.

(*a*) Wounds may be found upon the body—most commonly, however, on the head—some of which are contusions, some incised, and some lacerated, which at first sight look as if they had been produced by two different classes of weapons. This is not so, however, in the bulk of cases; they are caused by the same weapon, and in this way: the assailant seizes a bottle by the neck and hits his opponent, from which contusions or lacerated wounds may result. But as the result of the repeated concussions, or of greater force, the bottle breaks while he is yet pounding his victim, and thus incised wounds are produced. The same remarks apply to an article composed of earthenware, such as a jug.

III. Contusions found upon the body, in the great majority of cases, are the result of forcible application of a blunt instrument. In most cases they do not afford any further clue to the character of the instrument used, but occasionally from their defined character and from the presence of more than one mark of like shape upon the body, some opinion may be offered; for example, a series of contusions in the form of stripes, the breadths of which closely correspond to each other, would be indicative of the application of a stick, or a leather strap, or other like weapon. Again, the amount of extravasated blood is, sometimes, no index to the severity of the violence offered, as in injuries to the vulva or penis, because of their peculiar vascular structure, and to persons of scorbutic, purpuric, or hæmophilic tendency, on account of their extreme susceptibility to bruising from small degrees of violence. It must also be noted, as already pointed out, that ecchymoses may appear and develop spontaneously. So that in offering an opinion as to the amount of violence used from the extent of the ecchymosis, the preceding factors must be previously considered by the examiner.

IV. Wounds which are circular, slit-like, or triangular in shape, and to which on other parts of the body in a more or less direct line other similar wounds correspond, may usually be reckoned as having been produced by traversing missiles. Single wounds of this character may either be due to a missile which has entered the body and is retained therein, or to such an instrument as a pointed piece of stick or a butcher's steel. Usually the history of the case will determine the difference, and in dead bodies, dissection will probably clear up the difficulty. The diagnosis of gunshot wounds is obvious, when around the wound are found scorching or engraining of the skin with particles of carbon, or incrustation with the products of smokeless powder.

Wounds: The Significance of their Situation, their Dimensions. Direction, etc.—In dealing with wounds which form the subject of medico-legal inquiry, the greatest accuracy in their description must be observed. In estimating their dimensions, it is not enough that approximate measurements be made, but such must be exact in every particular. The following points with reference to wounds require to be carefully noted: (1) the *situation*; (2) the *shape*; (3) the *direction*; (4) *dimensions*.

1. The *situation* of the wound. Sometimes from the position of the wound on the body, some light may be thrown upon the mode in which it has been produced. Certain parts of the body are the elect seats of suicidal wounds, as, for example, the throat, chest, forearm, groin, and thigh; while wounds on other parts of the body oppose, if they do not, indeed, absolutely negative the idea of suicide, by reason of their inaccessibility, as, for example, on the vertex of the head, or on the back. Not only do wounds on the vertex most usually negative suicidal production, but also accidental production, because it is impossible to injure the vertex by a fall from the standing position. While multiplicity of wounds upon a body most commonly indicates homicidal violence, this is also found in cases of accident or suicide, although more rarely. In cases where wounds are found upon the throat of a dead body, it is advisable always to carefully examine also the hands.

In this way it may be possible to distinguish, although not always, between homicidal and suicidal cut-throat wounds, for in the former class of cases, unless the person be taken unawares from behind, or in a state of sleep or other form of partial unconsciousness, the hands when used in defence are liable to be injured. Homicidal wounds are usually inflicted over some vital region of the body, either on the front of the thorax near the region of the heart, on the neck, on the head, or on the back between the shoulders. (Fig. 46.)

FIG. 46.—Mortal Wound of the Heart caused by Stabbing. The wound was situated $1\frac{1}{2}$ inches below the level of left clavicle and $2\frac{1}{4}$ inches to the left of middle line of sternum. It measured $\frac{11}{16}$ of an inch in length, $\frac{5}{16}$ of an inch at point of greatest breadth, and was fusiform in shape. The direction of the wound was from above downwards and from left to right, passed into the thorax between the first and second ribs, severing part of the cartilage of the second rib, then through the mediastinal tissues and pericardium, and entered the aorta at a point $1\frac{1}{4}$ inches above the point where that vessel leaves the left ventricle. The pericardial wound measured $\frac{19}{32}$ of an inch in length, and the wound in aorta $\frac{5}{32}$ of an inch: thus showing that the weapon was tapered towards the point.

2. The *shape* of the wound may afford information of an important kind. From the business-like way in which a throat has been cut, or from the unsurgical mode in which a body has been divided, suspicion would, in the former case, fall upon a person whose work lay in that direction upon animals, as a butcher, and in the latter, upon a person who was unacquainted with the anatomical conformation of the body.

In the Glasgow Pollokshields tragedy which was tried at the December Circuit Court, 1892, it was shown in the medical evidence that the body of the victim had been cut up into several parts, that the neck had been severed from the body with a saw, that the bones of the thigh had been divided by the same tool, and that the cause of death was a wound in the throat which severed the carotid arteries. The like rough manner of dividing the body was observed in the Wainwright tragedy. In the Rainhill tragedy, 1892, four of the five victims were murdered by cut-throat wounds, and in at least one of the four, the wound in the throat had divided all the tissues of the neck, and severed the connection between two of the cervical vertebræ, while in the fifth, the cause of death was strangulation, produced in the manner already described.

3. The *direction* of the wound has often an important bearing as indicating the relative positions of the assailant and assaulted at

the time the wound was inflicted, especially in the absence of eye-witness of the commission of the crime. This is, perhaps, more true of gunshot than of other forms of wounds, particularly when the missile penetrates the body. In such cases the particular direction from which the shot has been fired sometimes becomes of the greatest importance in establishing connection with any given accused or suspected person.

In the famous Ardlamont case which was tried before the High Court of Justiciary in 1893, before the Lord Justice Clerk and a jury, this question was of supreme importance, since upon it vital issues depended. The charge in the indictment against the prisoner Monson was that "on the 10th August, 1893, at a part of a wood situated about 360 yards or thereby in an easterly or north-easterly direction from Ardlamont House," he "did shoot Windsor Dudley Cecil Hambrough, and kill him, and thus did murder him." The prisoner pled not guilty. It was shown in evidence that the prisoner, along with another man named Scott or Sweeney, who was also charged in the indictment with the same crime, but who did not appear to answer to the charge, went with the deceased to shoot in the wood in which the body of deceased was afterwards found. The body was first examined by a local practitioner, who, in his report, certified that he found on the body a scalp wound extending from the right side of the occipital protuberance to near the right ear, part of which had been carried away. This wound, a large and ragged one, measured about 3½ inches by 1½ inches. About the centre of the scalp wound there was an irregular opening, about one inch in diameter, right through the occipital bone into the brain. The bone had been carried into the substance of the brain. The brain-substance was protruding from the wound, and blood had escaped rather freely. The wound was exactly what he would expect to find from a charge of small shot, fired from a distance of perhaps twelve inches. The shot had not time to spread, as there were no separate bullet marks. There was no blackening of the parts in or near the wound, due, as the witness believed on information supplied him by the prisoner, to the use of "amberite," a nitro-powder. The skin or hair was not burned. The cartridge-cases, including the empty one by which the supposed accident had been caused, had been removed by the prisoner, and the doctor did not see them. From these facts, the doctor reported that, in his opinion, the death was probably due to accident, the gun having gone off while in the hands of deceased, during his attempts, it was believed, to save himself from stumbling when walking along a turf-topped wall. It appeared, however, later, on further inquiry by the Fiscal, that "amberite" cartridges were not manufactured for the bore of gun used by the deceased, and, further, that a previous attempt on the life of the deceased by drowning had been made by removing the plug in the bottom of a boat under the foot-boards, so as to swamp it; and, in addition, that the prisoner, who was said to be in financial difficulties, had made efforts, successful and unsuccessful, to effect insurances for large sums upon the life of the deceased. The theory of the prosecution, therefore, came to be that the prisoner wilfully shot the deceased from a little distance; that of the defence, that the deceased in attempting either to scale, or walk along the top of, a wall, stumbled, whereupon his gun had gone off lodging the charge of shot in his head. Before the trial, a second examination of the exhumed body was made by Sir Henry Littlejohn and by Dr. M'Millan the local medical man who had formerly reported on the case, in Ventnor Churchyard, where the body had been interred. In their joint report, they gave a detailed description of the wounds in the scalp and cranium. The former in his evidence at the trial further stated as his opinion from that examination, that the injuries had been caused by a charge of shot which had entered the parts from behind forwards, but that the injuries were only due to a portion of the charge, and not to the entire charge. He was further of opinion that the charge had been fired from a distance of from 3 to 9 feet, probably nearer 9 feet than 3 feet. These views were corroborated generally by other medical witnesses for the prosecution, as well as by gun-experts, the latter of whom testified that, from certain markings on trees and shrubs in a given line, the shot must have come from that direction. For the defence, however, evidence was adduced by other medical and gun-expert witnesses to the effect that the injuries could

be accounted for by the discharge of the deceased's own weapon, and that the distance of the mouth of the gun-barrel from the head of the deceased might be any distance between a few inches and about 3 feet, but not exceeding 4 feet, and that the charge struck the head at a very acute angle. The jury returned a verdict of "not proven." This case is remarkable in respect of the amount of experimental evidence which was given by the witnesses, based upon the effects produced upon objects by charges of small shot fired at varying short distances.

We have seen two cases in which a charge of small shot has accidentally produced a wound which might have been caused by a single old-fashioned round bullet.

1. Two gamekeepers were out shooting grouse. They were lying on their backs behind a low wall waiting for the birds which were being driven towards them. One of them, resting uncomfortably, clumsily shifted his position, and in doing so, the trigger of his gun caught in his shot-belt, and the discharge from the gun went into the foot of his companion under and behind the ball of the great toe. On examination of the foot, one irregularly-circular opening with blackened edges was found in that position, and on the dorsum of the foot, a large irregular opening in which all the tarso-phalangeal joints were exposed. The gun was charged with No. 5 shot; the distance from the muzzle of the gun to the part of the foot struck was about 2½ feet. The foot was amputated, and the man did well.

2. The facts of the second case are these: a party was out grouse-shooting. Two of the party were defiling through a gap in a ditch in a crouching attitude, when the charges of both barrels of the gun of the second man went off accidentally and struck the man in advance between the shoulders, ploughing a way for themselves in the tissues over the spines of the upper dorsal vertebræ, and producing one long, ragged wound which exposed in its base two of these spines, but without fracturing them. From the attitude of the man in advance, the discharge then passed over the back of his bent head. The distance between the gun-mouth and the part struck was estimated to be between 3 and 4 feet.

The following cases illustrate accidental wounds from loaded revolvers:—

1. Two young boys, tired of playing indoors on a very wet day, thought they would clean their father's revolvers. The elder taking one out of the case, pointed it at his brother, making the playful remark: how would he like to be shot? To his consternation, the pistol, which unknown to him had been lying in the case loaded, went off, and the bullet struck his little brother in the face, and he instantly fell. On examination of the boy a few minutes thereafter, we found a small bullet wound, somewhat irregular in shape, situated between the inner angle of the right eye and the base of the nose, which had evidently penetrated the brain through the orbital plate, because brain substance appeared in the wound. Surrounding the wound were engrained particles of unconsumed powder in the skin. The bullet was a conical one ⅜ths of an inch in diameter, and the distance of face from the revolver-barrel mouth was about 2 feet. The boy died. On post-mortem examination the bullet was found in the brain.

2. This case was also the result of a revolver accident, and presents several points of interest. It was recorded by Dr. Ward Cousins.[1] The facts, shortly, are these: a girl, aged 16, was holding in her hands a revolver, and at the moment of discharge, the muzzle was pointing toward the stomach. The bullet entered the abdominal wall 2 inches to the left of the umbilicus at a point about midway between it and the ninth costal cartilage, and passed out behind on the right side of the spinal process of the twelfth dorsal verebra, but without perforating the clothes behind. The missile was a "cylindro-conoidal bullet, half-an-inch in length, five-eighths of an inch in thickness, and it weighed 120 grains." After passing through the abdomen, it was flattened on one side near the point. The edges of the wound of entrance were black and discoloured. In its passage, it had perforated the stomach, which was sutured by operation, and the girl recovered.

[1] *B. M. J.*, vol. ii. 1898, p. 145.

3. It would be difficult to say whether the wounding in the following case was accidental or intentional, but the facts of it are somewhat unique. A boy, aged 6, was playing with his companions in the public street, and suddenly stopped his game complaining loudly of a sudden pain in his stomach. He was able to walk home. He was seen by a doctor who found a wound on the right side of the pit of the stomach which he thought might be due to a missile from a pistol. No pistol-shot had been heard at the time by any of the boys, although, by reason of the noise of the busy thoroughfare in which they were playing, that might have happened without it having been heard by them. The boy becoming gradually worse, was sent to the Infirmary, where he died. On post-mortem examination of his body, we found a wound, covered by a crust or scab, measuring $\frac{7}{16}$ths by $\frac{3}{8}$ths of an inch, which was situated on the right side of the pit of the stomach about $\frac{5}{8}$ths of an inch from the middle line of the body and at the lower border of the cartilage of the tenth rib on the right side. In the right chest were twenty-four ounces of pus, the right lung being collapsed and functionless. In its lowest lobe, an irregularly-conical bullet or slug was found which measured a quarter of an inch in length and $\frac{3}{16}$ths of an inch in diameter, and which, from its appearance, looked like a missile commonly used in an air-gun. No clue was found to the perpetrator.

But the direction of the wound may also be of importance in cases of incised wounds by stabbing or otherwise. When the relative position of assailant and assaulted is a question of moment by reason of absence of direct evidence as to the manner of the infliction of the wound, the medical examiners are expected to offer some opinion on the point from the wound itself. In three cases in our experience where death was caused by stabbing, the direction of the wounds, which in each case penetrated the chest and the aorta or pulmonary artery at their points of origin from the heart, or the left ventricle, showed that the assailant—in each case a right-handed person—had attacked his victim in front and from the right side; and in a fourth case, where the victim was first struck on the forehead by a hammer, and then stabbed in the root of the neck with an ordinary breakfast table-knife, it was evident that the head blow had been administered from behind, and the neck wounds produced while the assailant stood behind the head of the fallen victim.

The points to be attended to by the medical examiner in any case of wounding may be summarised as follows :—

1. The dimensions of the wound, accurately measured ;
2. The relation of the wound to anatomical land-marks on the body, and in the case of more than one wound, the relation of each to the others in measured distances ;
3. The character of the wound or wounds, with respect to the class of weapon by which it, or they have been produced ;
4. The direction of the wound, where it penetrates the tissues.

It is also of prime importance, where wounds are found upon a part of the body usually clothed, to examine the different superposed garments together and separately. All evidences of the passage of instruments through the fabrics must be carefully noted and measured, as well as their relation to the situation of the lesions on the body ; for it sometimes happens that a clue is thereby afforded to the exact position of the assaulted person at the moment of the assault, a point which is of much importance, especially in penetrating wounds of the chest. It occasionally happens, also, on examining an undergarment not tight-fitting, that more marks of perforation are discovered

than there are wounds on the part of the body corresponding to the position of the garment, or in the superjacent garments. This, at first sight, is somewhat puzzling; but it is simply due to a wrinkling or folding of a voluminous under-semmit, which upon being spread out for examination will reveal three perforations instead of one. This may be easily demonstrated by doubling a piece of paper on itself and perforating it with a knife, and thereafter spreading it out flat.

In the examination of a dead body upon which there is a wound or wounds, the following questions are bound to arise for answer:—

Is the Injury or Wound mortal? and, where there are more wounds than one: Which of the Wounds was likely to prove mortal or dangerous to life? Such questions must be answered in the light of what has already been said regarding mortal wounds. But it must be borne in mind that death may result, in certain circumstances, from a comparatively small wound which, under other circumstances, would not prove fatal. This point is exemplified by the following cases which fell within our experience.

1. The dead body of a woman, aged 44, was found in bed. The mattress was soaked with blood. The body was pallid, as from the effects of hæmorrhage. On the inner side of the calf of the right leg a small circular wound was found, which, on examination, was discovered to open into a large varicose vein.

2. The dead body of another woman, aged 65, was found in bed, under nearly parallel circumstances, the bedclothing under the body being saturated with blood. A small circular wound was discovered on the inner side of left ankle, which opened into a dilated varicose vein.

In both of these cases, the women lived alone. From the position of the bodies it was apparent that the rupture of the vessels had occurred during sleep, and that they had bled to death.

The next question which arises is, Was the wound or wounds inflicted during life, or after death?

The following points must engage the attention of the medical examiner before answer, viz.:—

1. Do the edges of the wound, or wounds, show evidence of vital retraction?
2. Has there been more or less copious bleeding, and, if so, are there spirts or jets or sprays of blood in or near the vicinity of the body?
3. Are clots of blood present in the wound itself, and clotted blood in the neighbourhood of the body?
4. Is there staining of the tissues of the wound by blood?
5. Are there any signs of vital reaction present?

The signs of vital reaction can never, obviously, be observed in the case of mortal wounds, but they may be found in cases of wounding in which, but for the mere accident of individual circumstances, the wounds would have proved quickly mortal, as in wounds of the heart or large blood-vessels, but in which the person lives for a day or two afterwards. In contusions, the signs of ante-mortem production are the following, viz.: (1) swelling of tissues; (2) discoloration of skin; (3) presence of blood in subcutaneous cellular tissues, as revealed on incision, the amount of which will depend upon (*a*) degree of original violence, (*b*) nature of tissue injured, and (*c*) condition of bodily or constitutional health of person at the time.

The absence of the foregoing appearances would point to post-mortem production, except in bodies taken from the water, in which, by reason of the water washing away all evidence of hæmorrhage, the answer to the question becomes exceedingly difficult. But it ought to be borne in mind that so long as molecular life remains in the tissues not only is retraction of edges possible in wounds then produced, but a certain amount of bleeding will occur by gravity, if the operation of this force can prevail, by reason of fluidity of the blood remaining so long as the body is warm. For the same reason, limited contusions may be produced on a body just after death; but even in this case the amount of subcutaneous extravasation and the consequent superjacent swelling of tissue will be less.

Data from which to infer the Age of a Wound, or Wounds.—It becomes of some importance to the criminal authorities where it is tried to establish connection with a certain crime of a given suspected person upon whose body there is a wound, and where the fact is known that the actual perpetrator was wounded at the time of its commission, to know whether or not the wound found on the body of the apprehended person corresponds to the conditions of a wound inflicted at the given time. If, in such a case, from the appearance of the wound, the medical witness can reasonably show that the said wound was probably produced within a time covered by the interval between the commission of the crime and the date of apprehension, that and other facts may lead to the proper conviction of the culprit. In this connection, the following data may assist in answering approximately the foregoing question:—

1. A wound which shows vascular congestion and accompanying œdematous swelling but absence of connective tissue elements, may be deemed to be of less than 48 hours' duration.
2. A wound which begins to show evidence of tissue-regeneration, may be reckoned to be from 5 to 8 days old.
3. Pus usually appears in a wound from the 3rd to the 4th day after production.
4. In wounds which heal by first intention, especially if limited in length, the edges may be temporarily glued together by serum within 48 hours of their production, but not permanently until 4 to 7 days.
5. When a wound heals by granulation, as it always does where there is loss of substance and where the edges cannot be brought into surgical continuity, the stage of granulation exists for so variable a period, depending upon so many factors, that an answer, when ventured upon, can only be given from the experience of the individual observer, and even then, should be given with great caution.
6. A recently-healed wound exhibits a cicatricial cuticle which, at first, forms a thin, bluish, transparent membrane; when older, a rosy or brown coloration; and when still older, a white and dense appearance.

Whether is the Wound, or Wounds, of Accidental, Suicidal, or Homicidal origin?—This question is bound to arise in every case where a dead body is found upon which there are marks of violence.

While in the bulk of cases, probably, it is capable of answer from the moral circumstances of the case, there is a series in which the medical examiner, from observation of the wounds and of the *locus* of the deed, may be able to offer testimony of the most valuable nature.

The criminal authorities expect that when a medical examiner is called upon to examine such a body *in situ*, he shall note every point on and around the body which might throw light upon this question. Among these points, the following ought, certainly, to be noted :—

1. The position of the body, if in a room, with relation to prominent objects of furniture, and to weapons, if such be present;
2. The presence or absence, and if present, the incidence, of blood-stains on or near the body, and upon such objects or weapons;
3. The applicability of such objects or weapons to the production of the injuries found;
4. The general appearances of the surroundings of the body, as evidences of marks of a struggle;
5. The condition of the hands of the deceased with respect to blood-stains, or the clutching of weapons, hair, or bits of clothing, etc.;
6. The physical appearances of the effused blood,—in pools, or splashes, or streaks, or trails, or jets,—and if in the form of jets or sprays, the direction of the flow, and their position with relation to the position of the body when found, as throwing some possible light upon the position of the deceased at the moment of infliction of the wound.

The following case which was tried at the Glasgow Circuit Court, March 1899, illustrates several of the foregoing points. The facts of the case were, shortly, these: In a house in Dunoon, in which for the time being lived a young man, the prisoner, and an old woman of 82 years of age, it was alleged the prisoner had inflicted the injuries of which the latter died. From the evidence it appeared that on Monday, 5th December, a doctor was called to see the old woman. He found her lying in bed in an unconscious condition. Her pulse was hardly perceptible, and her breathing feeble. On the right side of the face over the eyebrow was a lacerated wound about an inch long, there was ecchymosis of left eye, and certain other marks of supposed violence on the side of head and neck of a "maroon" colour. He further testified that erysipelas was present round the wound over the eye. The woman died. A post-mortem examination of the body was made by the medical attendant and another medical man who reported as follows: That the following marks of violence were found on the body, viz.: (1) a contusion of a deep "maroon" colour on the right side of the face and neck extending from the scalp down to an inch from the collar bone; (2) a lacerated wound about an inch long over the right eyebrow; (3) ecchymosis and swelling of left eye; (4) an abrasion over left cheek-bone; (5) a contusion on and under the chin; (6) various bruises on the scalp; (7) a bruise on the right shoulder; (8) various other small bruises on the body; (9) fracture of the 3rd, 4th, 5th, and 6th ribs on left side, with a double fracture of the last two ribs. In giving their evidence, the reporters stated that they did not dissect the bruises; that they examined the bedroom in which the alleged assault took place, and that they found on the woodwork of the window of the room blood-stains with grey hair adhering to them, which resembled the hair of the deceased. They gave the opinion that death was due to shock, the result of the combined injuries, that the injuries could not have been produced by an accidental fall, but were the result of assault by kicking with a booted foot, or by a person kneeling upon the chest, that the injuries on the head and face were produced by a flat broad weapon laid on with considerable violence, such as the flat back

rail of a chair, and, further, that the scalp bruises were caused by handfuls of hair having been forcibly pulled out by the roots. Such a detached chair-rail was found in the bedroom, but they testified that, having examined it, they found it quite clean and with no marks upon it. Another witness, the tenant of the house, who chanced to be from home at the time of the occurrence, testified, however, that said rail had been detached for some time. We were asked by counsel for the defence to examine the said report, and also to make an examination of the premises, and of the productions in the hands of the Crown if such was considered necessary. We carefully examined the premises, and the following was what was found: the room in which the body lay at the time of death was situated on the right of the hall on the ground floor, and the room in which the alleged assault took place, in the flat above. From the hall leading to the upper flat was a wooden stairway, about the middle of which was a comparatively acute bend, and from the top landing, for about a third of the length of the stair on the left side, was a heavy corniced balustrade with comparatively sharp corners. On the stairway, and on its lowermost step, we found a blood-stain measuring one and a half inches in diameter. This was the only stain on the stair. On the wall of the stairway, at a height of 3 ft. 8 in. from the step-level and in a direct line downward from the top landing of the stair, was a fresh indentation and break in the wall-paper, which was partly separated from the wall, of a nearly circular shape, beneath which the plaster was bruised into fine powder. The room of the assault was next examined. It had been left exactly as it was found by the police. There was no appearance of any struggle. On the wooden facing of the window, which had a comparatively sharp edge, about 2¾ feet from the floor we found a slight indentation in the wood, and in its neighbourhood certain marks of blood, viz.: running floorwards from the indentation was a tiny stream of blood which had dried, and around the indentation were circular and inverted soda-water-bottle shaped marks of blood, the latter of which, especially, pointed to the fact that the blood had been forcibly projected against the woodwork from a point close to the woodwork. In addition, on the window facing were irregular, thin smears of blood, in two of which were found hairs which were detached and taken for microscopic examination. Close to the wooden facing on which the blood-spots were found stood a wicker-work arm-chair covered with a light-coloured chintz, on the extremities of the arms of which, at a point where the hands of a person seated in a chair would naturally rest on attempting to rise, were bloody finger-marks and smears. Close to the right of the chair stood a low chest of drawers, its top being about 1½ feet higher than the arm of the chair, on the right edge of the covering of which were more bloody finger-marks. On the other side of the narrow room stood a bed, on a pillow cover of which was a small stain of blood; between that and the fireplace stood a wash-hand basin, and adhering to the soap in the soap-box were three hairs which were taken for examination; and in the grate, in which there had been no fire for a long time, was a small ball of loosely rolled hair, which was also taken away. There were no blood-stains on the carpet, but there were many small pieces of broken plate-glass and a small oblong piece of metallic mirror which looked like the reflector of an oil-lamp. We afterwards examined the productions in the hands of the Crown authorities in Glasgow, which consisted of body-clothing and bedclothing—all of which were blood-stained—the flat back rail of a chair on which there were no marks of blood or anything else, and some loosely rolled coils of hair, constituting, to all appearance, what a lady would call "combings."

From these facts, therefore, the following points stood out clear, viz.: (1) there was only one wound of the skin on the body of deceased; (2) there was a place in her bedroom—the wooden window-facing—which bore the marks not only of forcible contact, but by reason of the blood and its characters, of contact with a living human body; (3) there was no other *evidence* which indicated the source of the wounding. We were consequently forced to the conclusion, judging from the height of the marks on the facing from the floor, (1) that the wound on the right eyebrow had been caused at that point, and by a fall, because the point of impact was lower than her head when standing erect, and (2) that she had either been partly stunned by the fall or was unable to rise, because of the presence of the tiny stream of blood on the wood which ran down to the floor. It came out in the evidence later that the deceased was very lame, in fact was partly palsied and was liable to falls. Our view was that after she picked herself

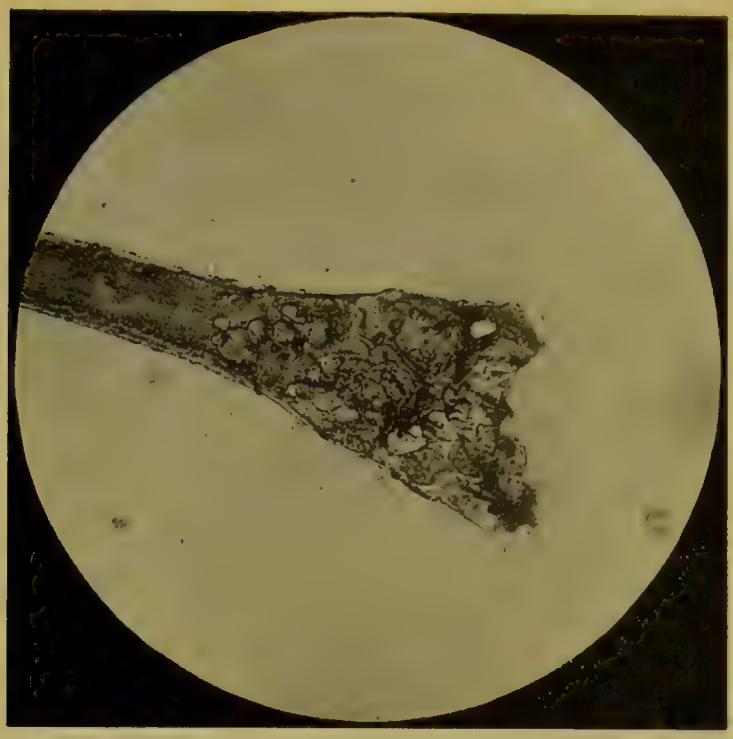

FIG. 47.—Showing Hair-bulb in a state of Fatty Degeneration. The above is a photo-micrograph of one of the hairs of the deceased in the Dunoon Case tried in Glasgow, March 1899. × 500 diameters. (Author.)

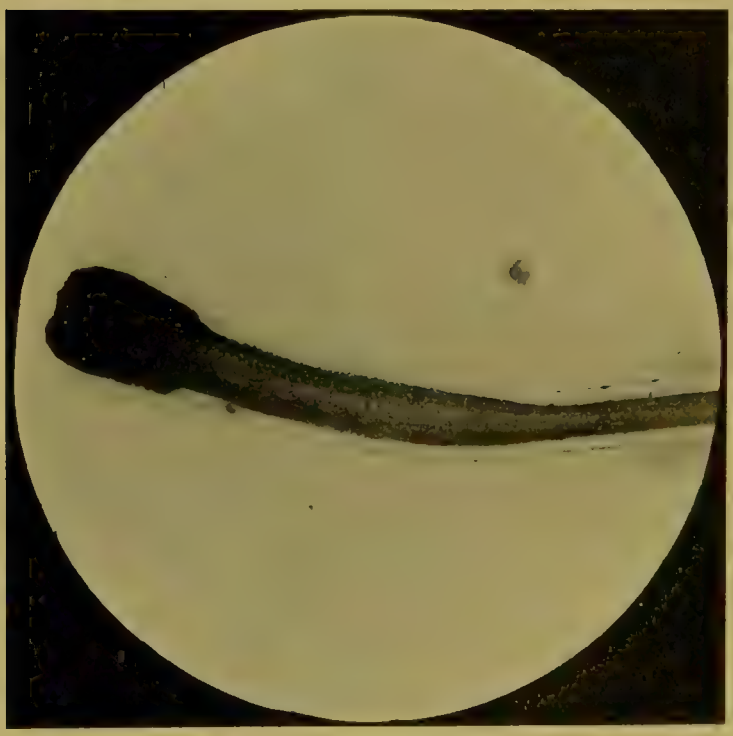

FIG. 48.—Photo-micrograph of Human Hair pulled forcibly from Scalp. The ruptured sheath is seen at the right of the figure. × 500 diameters. (Author.)

up and got up into the adjacent arm-chair, feeling her face damp but not being able to see why, because the room was said to be dark by reason of the lamp having fallen and having been broken, she put up her hands to adjust her hair which had evidently become dishevelled to some extent by the fall, as shown by the presence of the hair sticking in the dried blood at the point of impact, soiled her hands with the blood from the wound over her right eye, tried to rise with the aid of the arms of the chair, thus soiling the chintz, and likewise the white covering of the drawers with her bloody fingers, then tottered across the room to her bed where she evidently lay for only a very short time, judging by the small stain on the pillow. Being all this time in the dark, she rose to go downstairs for assistance, and on reaching the landing, which like the room and stairs was dark, she missed her footing, banged her body in the fall against the sharp-edged bannisters, broke her ribs, and fell to the bottom of the stair, on which we found the blood-stain, which

indicated that she had lain there for a little time. This was the opinion we arrived at of the cause of the injuries, as could be drawn from the facts as narrated. Several of the points, such as the breaking of the lamp and the want of light in the room, were corroborated, apart from the prisoner's own statement. The hairs which were found in the blood smears, and those adherent to the soap in the bedroom of the deceased, were examined and compared with the loose coils of hair in the possession of the Crown, and the microscopic examination showed that they all evidently belonged to an aged person, and that the bulbs were in a condition of atrophy and fatty degeneration, thus likely to be shed naturally, and none showed the appearance of having been forcibly pulled from the scalp. (Figs. 47, 48, 49 and 50.) The jury returned a verdict of not proven.

In another case of undoubted murder, in which, however, the murderer was not got, the nature of the assault was written on the walls and furniture of the room in

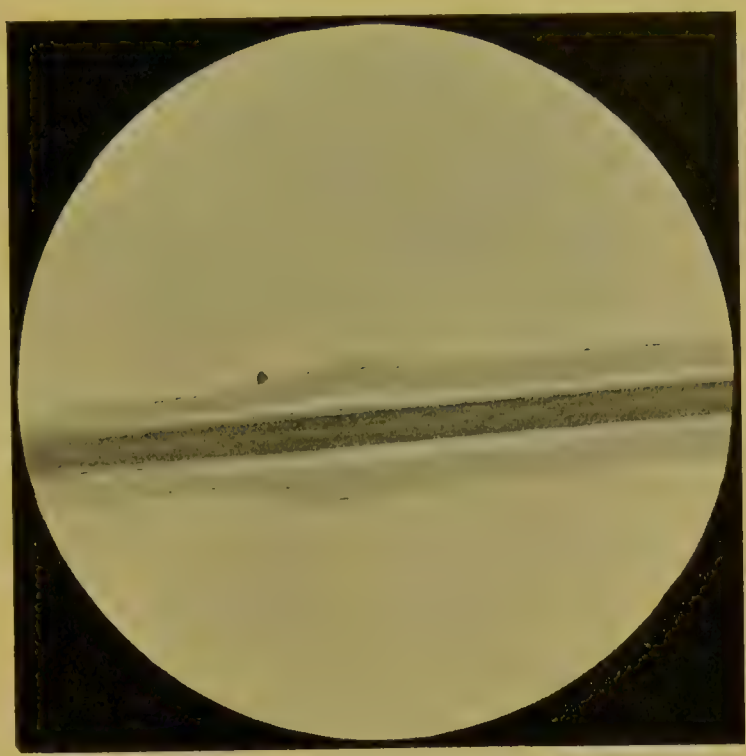

FIG. 49.—Photo-micrograph of Human Hair plucked forcibly from the Scalp, showing ruptured sheath; a continuation of Fig. 48. × 500 diameters. (Author.)

FIG. 50.—Hair pulled forcibly from the Scalp. The torn sheath will be seen at the lower end of hair, which corresponds to the bulb end. × 300 diameters. (Author.)

which the deed was committed. The body was that of a woman of known loose habits, and it was because of this that the neighbours did not interfere on cries being heard coming from her dwelling. The body was covered with dirt mixed with blood, particularly over the chest, arms, and legs, although there were also blood marks on the hands and wrists, face, and head. The marks of violence which were very numerous, consisted of bruises, lacerated wounds, and compound fractures. There were 29 separate bruises, proved on dissection, most of which were situated on hands, forearms, head, face, and shoulders. There were 20 lacerated wounds, some of them 4½ inches in length, which were situated chiefly on head and face. There were two compound fractures; one on the left cheek, in which the malar bone and the left side of the upper maxilla were broken in pieces, the other, over the left eyebrow, in which a triangular piece of bone nearly an inch in length was driven in on the brain. In the apartment two large pieces of brick were found, one piece measuring 9 inches in length, and weighing 8¼ lbs., the other 5 inches long, and weighing about 3¼ lbs. Both bricks were covered with blood, in which was a quantity of adherent hair which corresponded to that of the deceased. A third piece of brick, wedge-shaped, and ending at one extremity in a comparatively sharp, serrated edge, was also found, which, although also stained by blood, had no adherent hairs. Further examination of the apartment, which was absolutely without movable furniture, showed that it contained a fixed wooden press and a large coal-box, both of which projected into the apartment-space. There was no grate in the fireplace, but, instead, a considerable amount of soot, lime, and broken bricks. It might have been supposed that the cause of the various injuries was falls by this heavy woman, while intoxicated, upon these bricks and upon the wooden fixtures described; but any such view was at once dispelled when the distribution of blood over the apartment was noted. While here and there on the floor, large pools and smears of blood were seen, there were also plentiful marks of blood on the walls of the room and on the window-panes as high up as the upper sash, which consisted of circular and inverted soda-water-bottle shaped spots indicative of forcible effusion, or spattering, of blood; further, on the edge of the coal-box there were marks of bloody fingers, as if some one with bloody hands had rested the hands thereon. It was only too clear from the foregoing appearances that her assailant had picked up the pieces of brick which were lying handy, and that he battered the head and face of the woman while he chased her round the room, she, the meanwhile, putting up her hands to her head to protect herself, thus accounting for the large number of bruises on the hands and forearms. We reported that death was due to fracture of the skull with extravasation of blood upon, and injury to, the brain.

Passing now to the consideration of homicidal incised wounds to illustrate the same points, let us discuss those of the throat. It has been stated by some observers, that a homicidal cut-throat wound may be diagnosed by the determined appearance which it presents from a suicidal one which is often of an indeterminate character, and by the situation of the wound, which in suicide is said to be higher up in the throat than a homicidal one. It has been further asserted that suicidal cut-throat wounds never sever the whole tissues of the neck. To such sweeping statements we must demur. One of the undoubted suicidal wounds which we have examined presented the following appearances:—

It measured 8 inches in length, and severed completely all the tissues of the neck right down to the vertebral column, one of the bodies of which was nicked by the razor. This, however, was done by a young man who was insane. Another most interesting case, in which the severed carotid arteries and the jugular veins on one side of the neck were ligatured, and the patient recovered, is recorded by Mr. Thelwall Thomas.[1] This patient was practically moribund when Mr. Thomas began to ligature the vessels, but by the perfusion of warm saline solution, his breathing, which before was feeble and gasping,

[1] *B. M. J.*, vol. ii. 1895, p. 1420.

began to improve markedly. He recovered slowly, notwithstanding the grave lesions consequent upon the structures severed. The weapon used was a penknife. One other suicidal case, but a fatal one, is recorded by Galt,[1] in which there was "tailing" at both extremities of the main wound, and a second, but more superficial wound, below the former. The weapon used was a large bread-knife.

While in some cases there would seem to be a tentative appearance in suicidal wounds, such is by no means common to all. Homicidal cut-throat wounds, too, present varieties of character and appearance. Although they are comparatively rare, we have seen two cases. In the first, the situation and dimensions of the wound were as follows:—

The wound measured 7½ inches in length, and extended from a point one inch behind the left ear, and passed along the line of the lower jaw to a point 1¼ inches to the right of the middle line of the neck. At its extremity behind

FIG. 51.—Suicidal Cut throat. The wound began on the left side of neck and terminated at a higher level on the right side. The lowest level of the wound was 1½ inches above the line of the clavicles. In the wound the whole of the tissues down to the œsophagus were severed; the right half of the thyroid cartilage was practically torn out of the wound by the force used.

FIG. 52.—Another view of Fig. 51. The irregularly-pointed eminence at middle of upper edge of wound indicates the left half of the thyroid cartilage.

[1] *B. M. J.*, vol. ii. 1898, p. 711.

the left ear it tapered to a narrow point, but at the other, it had a notchy or serrated appearance. The line of the incision was not horizontal, but had a slanting direction downward toward the right side. In the wound, the larynx was intact, the left carotid sheath was opened, the left carotid artery was half-severed, as were also the internal and external left jugular veins and several muscles. There was no other wound on the body. The assault was made while the woman was asleep in bed, the bedclothing was saturated with blood, and jets of blood were found on the wall of the bedplace.

The second case was that of a woman who was murdered by her husband, who, afterwards, committed suicide with the same razor. The following illustrations show the wounds. (Figs. 51, 52, 53.)

The first illustration (Fig. 51) shows the wound on the throat of the man, which began on the left side of the neck and terminated at a higher level on the right.

FIG. 53.—Case of Homicidal Cut throat. Figure gives a view from the right side. The following wounds were found, viz.: (1) an incised wound in front of, and below the level of right ear; (2) an incised wound on front of neck above principal wound; (3) the principal wound itself (*vide* Fig. 42); and (4) an incised wound in the hypothenar prominence of right hand, severing the muscles from the bone. This last wound was evidently caused by the victim resisting the attack or attempting to shield herself.

The lowest level of the wound was about 1½ inches above the level of the clavicles. The tissues were entirely severed down to the gullet; the right half of the thyroid cartilage had been torn out of the wound by the force of the weapon, the left half remaining in the wound. (Fig. 52.) The second (Fig. 53) shows the position of the wounds on the right side of the body of the murdered woman, which consisted of the following: (1) an incised wound in front and below the level of the right ear; (2) a wound on the front of the neck, above the principal wound; (3) a wound on the hypothenar prominence of the right hand, in which the muscles were severed down to the bone. This last wound was likely caused by the woman trying to protect her throat and face with that hand. The third (*vide* Fig. 42) exhibits the wounds on the left side of the neck. The main wound extended from nearly the outer extremity of one clavicle to the other, and at the extremities was about half an inch higher than the clavicle. It severed the main blood-vessels.

muscles of neck, and trachea. The upper wound, as is seen, was bifurcated at its anterior extremity, and cut deeply into the tissues.

The two succeeding illustrations are those of a case recorded by Dr. Harvey Littlejohn,[1] which was also one of murder and suicide. When the room in the hotel, in which the parties were living as husband and wife, was burst open on the evening of the day in which they had not appeared, although called several times, both were found lying dead on the bed, fully dressed. The room was not in disorder, and there were no marks of blood in the room except upon the bed. The body of the woman lay on its back across the bed and the legs were hanging over its edge. Her face was covered with blood. On the left side of the neck was a clean-cut wound, 4½ inches in length, which extended from half an inch below the symphysis of the chin downwards and backwards to a point about 2 inches below the angle of the lower jaw. The wound divided the soft parts down to the deep vessels of the left side, severing the internal jugular vein but leaving the common carotid artery uninjured, though it was laid bare. The thyroid cartilage was divided, and the incision then passed backwards through the posterior wall of the pharynx down to the vertebral column, which was deeply scored. The deep vessels on the right side escaped injury, although they, also, were laid bare. In addition to the wound described, there were two superficial incised wounds on the face, one on the left side of the nose, the other in the middle of the forehead. (Fig. 54.) The wound in the man's throat showed that the thyroid cartilage was completely severed, all the tissues down to the deep vessels on both sides were cut through, but with the exception of the left internal jugular vein which was severed, these deep vessels were uninjured. At the beginning of the cut on the left side several tentative superficial cuts were found, which were absent in the case of the woman. Lying close to the hand of the man was an open, blood-covered razor. (Fig. 55.)

FIG. 54.—Homicidal Cut throat. The wound on the neck (left side) measured 4½ inches in length, extended from half an inch below the *symphysis menti* downwards and backwards to a point below the angle of the lower jaw. All the soft parts were divided down to the large vessels of the left side of neck, the internal jugular vein being severed and the common carotid artery laid bare, but uninjured. The thyroid cartilage was completely divided just above the true vocal cords. The incision passed backwards through the posterior wall of pharynx to the vertebral column, which was deeply scored. For the use of this and Fig. 55 we are indebted to Dr. Harvey Littlejohn of Edinburgh.

[1] *Edin. Med. Journal*, April 1900, p. 363.

One of the favourite sites of homicidal stab-wounds is the anterior aspect of the chest, and in the neighbourhood of the heart; wounds in this position from suicide are comparatively much rarer. The following short notes of cases—three of them from our case-book—will illustrate their situation, and other points:—

CASE I.—This fatal wound was caused by one Italian upon a fellow-countryman by one blow of a dagger-knife, and it was situated over the sterno-clavicular articulation of the left clavicle, measured $\frac{3}{4}$ of an inch in length, and entered the common carotid artery. Death was practically instantaneous.

FIG. 55.—Case of Suicidal Cut throat. In the wound, which extended from ear to ear, the thyroid cartilage was completely divided below its upper border, all the structures down to the deep vessels on both sides were severed, but the left internal jugular vein was the only vessel cut into. Tentative cuts were observed at the beginning of the incision in the skin on the left side.

CASE II.—This fatal wound was produced in the same way. It was situated $1\frac{1}{2}$ inches below the level of the left clavicle, and $2\frac{1}{4}$ inches to the left of the middle line of the sternum, measured $\frac{11}{16}$ths of an inch in length, $\frac{5}{16}$ths of an inch in breadth at its broadest part, and was fusiform in shape. The direction of the wound was from above downwards and from left to right, passed into the chest between the first and second ribs—incising part of the cartilage of the latter rib—through the mediastinum and pericardium, and entered the aorta at a point $1\frac{1}{4}$ inches above the point where that vessel leaves the heart. The wound in the pericardium measured $\frac{10}{32}$ of an inch in length, and that in the aorta, $\frac{9}{32}$ of an inch. These two wounds lay, with relation to one another, in a slightly slanting line from above downwards. The chest cavity contained many ounces of blood, and the pericardium about ten ounces. The man only survived a few minutes. (*Vide* Fig. 46.)

CASE III.—The subject of this fatal wounding was a vigorous young man, who after having been stabbed ran after his assailant not less a distance than 40 to 50 yards before he fell and died. On examination of the body we found on the left side of the chest, 3 inches below and $2\frac{1}{2}$ inches to the right of the left nipple, between the fifth and sixth ribs, a clean-cut wound, elliptical in shape, which measured half an inch in length and $\frac{3}{16}$ths of an inch at its point of greatest breadth. (Fig. 56.) Clotted blood was present between the lips of the wound, and dried blood on the skin around it. This was the only wound on the body. On opening the thorax, clotted blood—not large in amount, however.—was exposed lying on and in the tissues of the pericardium, in the centre of which

was an incised wound $\frac{3}{8}$ths of an inch in length. Twelve ounces of firmly-clotted and fluid blood were found within the pericardium. The wound on the inside of the pericardium was of the same length as that on its outside. Immediately underlying this wound was an incised wound in the left ventricle measuring one-quarter of an inch in length. When the left ventricle was opened this wound on its inner aspect was found gaping and to be somewhat triangular in shape. (Fig. 57.) All the heart cavities were empty of blood. The left pleural cavity contained four ounces of firmly-clotted blood. On further examination

FIG. 56 shows a Mortal Wound by Stabbing which penetrated the Left Ventricle of the Heart. The wound is situated on the left side of chest 3 inches below, and 2½ inches to the right side of the left nipple, between the fifth and sixth ribs. It was an incised wound, and measured half an inch in length and $\frac{3}{16}$ of an inch in breadth. Coagulated blood was found between the lips of the wound, and dried blood, small in amount, on the skin around it. The arborescent-like markings are due to post-mortem lividity. (*Vide* Figs. 57 and 58.)

it was seen that the weapon had passed through the cartilage of the sixth rib. (Fig. 58.) From the above indications it was apparent that the weapon used was a sharp-pointed, and probably, double-edged weapon.

CASE IV.—At the High Court of Justiciary (Circuit Court), Glasgow, November, 1900, a man was tried on the charge of murder by stabbing. The dead body of the victim was found in the public park, Paisley, stripped of jacket, vest, and boots, which the prisoner was wearing when apprehended. On the upper part of the left chest, between the second and third ribs, and two inches to the left of the middle line, an incised-punctured wound, horizontal in direction, was found, measuring half an inch in length. The left lung was found compressed by quantities of serum and blood, of each of which there was about two pints. There was a wound through the lung corresponding to the size and direction of the external wound. The pericardium was pierced by the wound over the line of the pulmonary artery, which was also penetrated at a point immediately above the semilunar valves. The total depth of the wound from surface of skin to pulmonary artery was nearly two and a half inches. There was no pneumothorax. The prisoner was convicted, and sentenced to 7 years' penal servitude.

But in homicidal woundings there may be many lesions instead of only one, and these may be caused by different weapons. The following case, from our note-book, is illustrative :—

The dead body of a woman was found lying in the front garden of a detached cottage where she had been attacked and murdered by her husband. The following lesions, grouped together, were found upon it : (1) a lacerated wound on the left side of the forehead, measuring one inch in length and severing the tissues to the bone, but unaccompanied by fracture ; (2) four incised wounds on the left side of neck, situated between the angle of the lower jaw, the clavicle, and the suprasternal notch, which severed several of the large deep blood-vessels ; (3) a slight abrasion over the right knee, and abrasions of skin

FIG. 57.—Mortal Wound penetrating Left Ventricle of Heart, caused by Stabbing (*vide* Fig. 56). The white paper dart shows the site of the wound which, on the exterior of the wall of the ventricle measured one-quarter of an inch in length, but which, on the interior of the wall was gaping and triangular in shape.

and bruising of left hand. The weapons used were an axe-hammer and an ordinary breakfast table-knife, on both of which blood-stains were found.

There is another class of woundings which from their severity and situation might easily be considered homicidal, but which are actually self-inflicted. The following is a most instructive case [1] :—

J. B., a single man, aged 29, on 5th Dec. 1879, called his medical attendant to attend to the following injuries : the left testicle was lying completely outside the scrotum suspended by the spermatic cord, which was unharmed, as was also the substance of the testis. The wound in the scrotum measured 1½ inches in length. He volunteered the statement that he had been attacked about a quarter of a mile from his home by three men, and assaulted in the above manner. Three men—neighbouring farmers—were apprehended on the charge.

[1] *B. M. J.*, vol. i. 1882, p. 72.

At the assizes, the assaulted man swore to the identity of two of them as his assailants. The two men were convicted, and sentenced to ten years' penal servitude. Again on the 13th Feb. 1881, he summoned his doctor, by reason of his having sustained another injury to his genital organs, which consisted of a wound two inches in length, at the lowest part of the scrotum, the direction of the wound being at right angles to the raphè. He said that on this occasion he had been attacked by four men, and he related circumstantially the details of the attack. He would not, however, vouchsafe any further information to the police authorities, or to any one else, as he said he wished the affair to be kept quiet. He, at the same time, expressed a feeling of regret that he had prosecuted in the first case, as he thought the men had been too severely punished. Being the subject of cardiac valvular disease, congestion of the lungs set in, of which he died in December of that year. A few hours before his death he confessed that the men who had been convicted were innocent, that he wished them liberated, because he had himself produced the injuries. In consequence of this confession, the Home Secretary caused a bill of indemnification to be brought before Parliament, whereby sums of money were given to the men for their unjust punishment, they having been at once liberated.

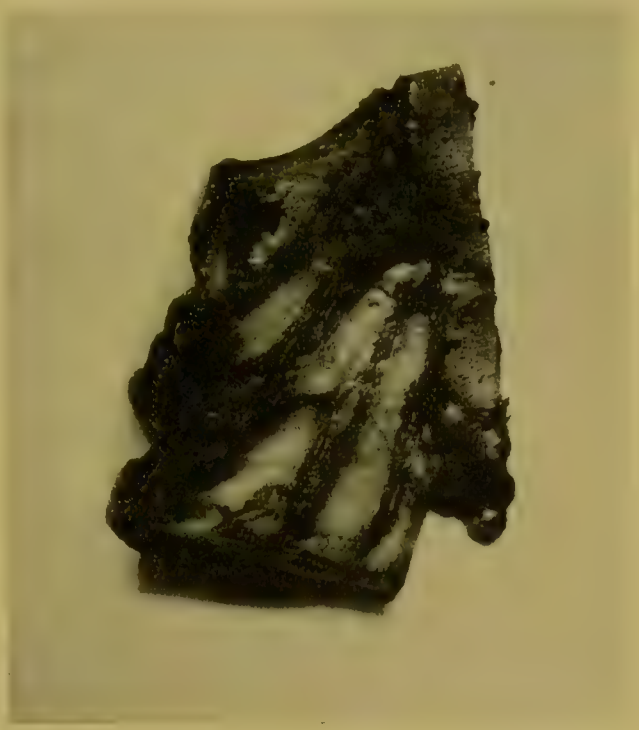

FIG. 58.—Mortal Wound by Stabbing (*vide* Fig. 56), showing the wound in the cartilage of the sixth rib close to its junction with the sternum. The illustration is of the interior aspect of the ribs, and the wound is indicated by the black line which runs nearly at right angles to the cartilage, which with those of adjacent ribs is attached to left half of sternum.

Another case of the same nature, with a confession of self-infliction, but without any accusation, is recorded,[1] in which, as a measure of atonement for having lived with a prostitute for some days, owing to a quarrel with his wife, a man cut open his scrotum with his pocket-knife, severed his left testis, and threw it from him.

Self-mutilation to evoke the sympathy of the charitable, or while labouring under delirium tremens,[2] is probably not very common, although it is by no means unknown. On the Continent, where the law of conscription obtains, limited self-mutilation to unfit the person for service is common, but it rarely takes the form of self-amputation of both feet by strangulation of the circulation and subsequent gangrene, as in a case recorded by Dr. Jamieson of Shanghai, of a Chinese beggar,[3] or of one foot by a carving-knife, by a patient in delirium tremens.

There can be little reasonable doubt that self-inflicted injuries of the genital organs in the case of males have their origin in more or less declared sexual monomania. Various cases might be cited to further substantiate this statement. Thiersch of Leipsic narrates the case of a young man, who, between the ages of 18 and 32 while single, and also after having been married and having

[1] *B. M. J.*, vol. i. 1882, p. 397.
[2] *Med. Press*, etc., vol. ii. 1885, p. 382.
[3] Idem, p. 397.

become a father, performed upon himself the following operations: at the age of 18, circumcision; later, and when married and a father, slit up his abdomen from symphysis pubis to umbilicus, which healed up; a year after, he laid open one side of his scrotum, from which the testis prolapsed but was replaced, and the parts were healed; some years later, in 1880, he again laid open his abdomen, which was again healed; in May of the same year, he removed his right testis, and stitched up the wound which he had made; and a month later, he removed the left testis. According to the narrator of the case, these acts were performed under the direct incentive of an uncontrollable impulse, which only disappeared after the removal of both testes.[1] In like manner, foreign bodies introduced into the urethra indicate a prurient tendency, or an early mode of manifestation of sexual monomania. In one case[2] a man inserted into his urethra a big bonnet pin for a lady's hat, and in trying to remove it, broke it, and left about 1½ inches of the round head end in the passage. Another unique case was one which fell within our experience, in which a man, a teacher, of gradually developing eccentric manner, one night threaded his scrotum and penis through the head of an ordinary large door key, and because of his inability to remove it on account of the swelling of the parts, sought our assistance.

A case is recorded in which acute delirious mania accompanied self-mutilation. The person, a young man, suffering from religious mania, had severed his testicles with a hand-saw, in addition to severely wounding the penis. He became apparently quite sane after he recovered from the effects of the chloroform which had been administered for the purpose of permitting surgical treatment of his wounds, but only for a few hours, for the mania returned worse than before, and he died on the ninth day in a state of coma, epileptiform fits having appeared on the fifth day, and having become more frequent up till the time of death.

But injuries to the sexual parts may, undoubtedly, be homicidal; it is enough to cite the series of Whitechapel and Lincoln (1898) tragedies to prove this. It is more than probable that these deeds were the result of monomania in the perpetrator.

This suicidal tendency may exhibit itself in woundings on other parts of the body. Instead of attacking the throat, suicides occasionally attempt decapitation by cutting the neck from behind. Little[3] records the case of a woman recently discharged from an asylum, who, with a blunt and rusty table-knife with which she had been peeling potatoes, made an attempt in this way to sever her head from her body. She had succeeded in cutting through the skin, muscles, ligaments, and into the spinal canal itself, without however injuring the cord. She died from septicæmia on the sixth day after. Suicides, too, may inflict many wounds upon their bodies. At an inquest held in London, it was shown in evidence that a suicide had inflicted seventy-one wounds on his body; in addition, a dozen lucifer matches were found in his stomach.

Injuries to the skull are most usually accidental or homicidal, and but rarely suicidal. In the differentiation of the cause, the attendant circumstances commonly reveal the truth, but it is by no means difficult to conceive cases in which, from the examination of the body, it would be impossible to distinguish between the two first-named classes. The following case which was tried at the Circuit Court, Glasgow, Dec. 1898, is illustrative.

The prisoner was tried on the charge of murdering his wife by throwing her, or pushing her, out of a window, whereby she fell a distance of 28 feet

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[1] *Med. Record*, 1881, p. 253.
[2] *B. M. J.*, vol. i. 1900, p. 633.
[3] *The Lancet*, vol. ii. 1889, p. 791.

and sustained such bodily injuries that she died thereof. The post-mortem dissection of the body revealed compound and simple fractures of the skull, fracture of left jaw, fracture of left arm, and compound fracture of right arm. The whole question of the guilt of the accused depended upon the lay evidence, which, not being sufficient to establish the charge, led to a verdict of "Not Proven" against the prisoner.

In another case tried at the same sitting of the Court, the injuries inflicted by a poker with a rounded head, consisted of twelve lacerated wounds of the scalp, and a large compound fracture of the skull on the right side of the forehead, in which broken bits of bone and brain substance were mixed up together. The evidence in this case was in the main circumstantial, and one of the points of evidence which connected the prisoner with the crime, was our discovery upon his clothing of spots of mammalian blood, circular, oval, and inverted soda-water-bottle in shape, which indicated, at least, that the blood had been bespattered over his clothing. These facts pointed to homicidal causation.

Of the homicidal infliction of the following injury there cannot be the remotest doubt. The following are taken from our notes of the dissection.

FIG. 59.—Comminuted Fracture of Skull produced by a fall from a window 28 feet from the ground.

The body bore the following marks of violence: a bruise on outer aspect of right arm below shoulder measuring $5\frac{1}{2}$ by $3\frac{1}{2}$ inches; right eye ecchymosed; left eye similarly bruised. In the lower left eyelid, toward the inner canthus, was a lacerated wound measuring $\frac{7}{8}$ths of an inch in length, which passed through the tissues of the lid, penetrated the tissues on the inner side of the orbit, and fractured the orbital plates of the upper maxilla and ethmoid bones. So much could be seen externally. On opening the skull and removing the *dura mater*, the surface of the right hemisphere of the brain was found covered by a thin layer of extravasated blood, which was markedly greater on the front and under surfaces of the right frontal convolutions. On carefully removing the brain, a laceration of the brain substance into which the little finger could easily be put, situated on the under surface of the right convolutions, was found, into which the *crista galli* of the ethmoid bone which had been detached by the blow, was driven. Although these injuries were so severe, the man lived for five days after their receipt. All of the head injuries, beginning from the wound in the eyelid and ending in the injury to the brain from the driven-in bone, were caused by a violent thrust of

a comparatively narrow, sharp-pointed poker, which, upon examination later, showed abundant evidence of blood-stains. We also made an examination of the woman's clothing and found many blood-stains on her jacket and petticoat. It appears that at the time of receipt of the wound the man was lying in bed in a state of semi-intoxication, with his face toward the fireplace, that he used provocative language to the accused, and that, in a fit of temper, she thrust at him with the poker, with the above result. She pled guilty at the trial. (Fig. 61.)

Punctured wounds of the skull may also be produced in young children by a variety of weapons, such as a gouge.[1]

It has been said, and in the main it is correct, that in hæmorrhage found in the brain, its situation relative to the bones of the calvarium, dura mater, and brain substance, may assist in enabling the examiner to arrive at an opinion as to whether it has been due to violence or disease; that where the blood is found extra-durally, that is, between the

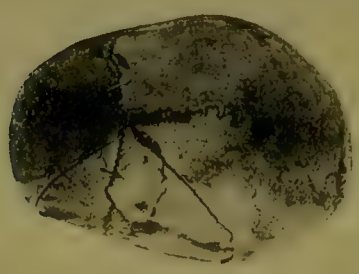


FIG. 60.—Another view of Fig. 59. The bones of the skull in this case were unusually thick.

bone and the membranes, the cause is due to violence, and that where it is found intra-durally or sub-durally, or into the substance of the brain, the cause is disease. From our experience, we believe that such a hard-and-fast rule should be received with great caution, for although it applies to the large bulk of cases, there are, nevertheless, cases where violence has undoubtedly been used, in which no fracture of skull has been caused, but laceration of the brain with consequent sub-dural effusion of blood. Such a lesion is most likely to arise from *contre-coup*. Of twenty bodies which we examined in which foul play was suspected, or in which there was definite evidence of violence, in *eight* there was fracture of some part of the skull with extra-dural hæmorrhage, in *one* fracture with laceration of brain and intra-dural hæmorrhage, in *three* laceration of brain only with intra-dural hæmorrhage, in *six* fractures in

[1] *B. M. J.*, vol. i. 1900, p. 700.

which the fractured bones had entered the brain substance with intra-dural hæmorrhage, and in the remaining *four* the cause of death was apoplexy with hæmorrhage into the brain-substance.

Various views have also been recorded as to the lines of fracture which are likely to result from falls upon the feet, falls upon the head, and from blows from different kinds of instruments. When it is considered how variable in thickness are the bones of the head in different persons of the same sex, how relatively thicker or thinner may be the bones of one person of one sex compared with the average condition of the bones of that sex, and how multiform are the modes and angles of impact of violence however occasioned, we

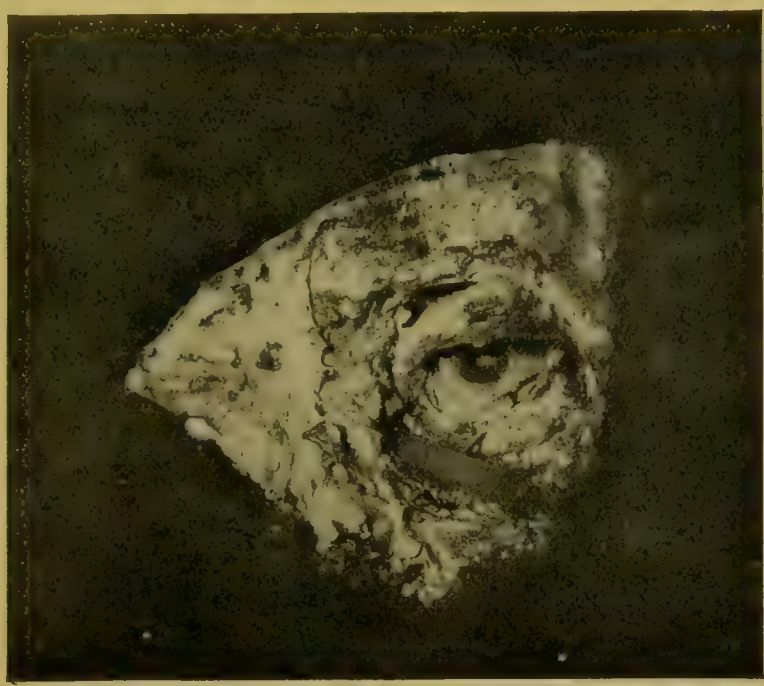


FIG. 61.—Fracture of Skull produced by Pointed Poker. The position of the quill indicates the point of entrance. (Author.)

should pause before committing ourselves to any theory. Some of the thickest skull-bones we have ever seen belonged to women, and some of the thinnest, to men. (Fig. 62.) The easiest fractures to diagnose from their appearance, relative to their cause, are those produced by pointed iron instruments, such as a pick-axe, a slater's hammer, or a lath-splitter's tool, all of which produce definitely localised, and irregularly circular fractures of the vault. The following case will prove of interest :—

A young man was charged with culpable homicide in that he had knocked over a man who had assaulted him, and who, in falling, had struck his head violently against the kerb of the pavement, from which he died. Our notes of the dissection of the body show that the deceased had sustained a recent fracture of the base of the skull extending up on the calvarium, and measuring in its total length three and a half inches, with accompanying hæmorrhage. But, in addition, on the vault of the skull, corresponding to a circular depression on the

head found externally before the head was opened, was a depressed fracture composed of pointed parts of bone all of which, however, were rounded off, thus indicating that it had been present for several years. On further inquiry, it was ascertained that twenty-one years before his death, this man had been assaulted on the head by one of his fellow-workmen with the pointed end of a slater's hammer. His wife volunteered the statement that, since that time, when he got intoxicated, he had developed an irascibility of temper and quarrelsomeness which were unknown to him before.[1] (Figs. 63, 64.)

The situation and incidence of fractures of the skull of newly-born children are said by some to be of considerable importance in deciding whether the injuries may have been produced during, and as the direct consequence of, difficult labour, or of precipitate labour, where the head of the child is projected forcibly from the mother's parts on the floor or ground, or by infanticidal violence. That congenital fissures may be

FIG. 62.—Fractures of Skull from applied Violence. The openings are due to trephine marks, the persons having been operated upon during life. (Author.)

found is without doubt, their position most commonly being in the occipital bone, in the parietal bone at its posterior and upper part, near the parieto-occipital suture; but fractures are comparatively rare in normal labours, or even in difficult labours, unless the mechanical aid of the forceps has been invoked.

Extensive cranial fractures are always the result of applied violence. Two illustrative cases will suffice:—

1. A man assaulted his wife with a poker while she was carrying in her arms her child of a few months old. The child was struck, in consequence of which it died. We found on dissection of its body, the following fractures of the skull, viz.: (*a*) on left side of head, a fracture measuring 4 inches in length, running parallel to the vertex of the head from before backwards; (*b*) at right angles to (*a*) a fracture 2 inches long; (*c*) on right side of forehead, a fracture 2¼ inches long;

[1] This fracture may be considered as a typical hole-fracture—the "loch-bruch" of the Germans.

(*d*) on right side of head, a fracture 4 inches long; (*e*) at right angles to (*d*), a fracture 3 inches long. The man pled guilty. (Fig. 65.)

FIG. 63.—Fractures of Skull produced by Pointed Instruments, viewed from exterior of Skull. That on the left was produced by a miner's pick, and that on the right by a slater's sharp-pointed hammer. The lines of fracture of external plate indicate the direction of the applied force. (Author.)

FIG. 64.—Views of Fig. 63 from interior of Skulls. In the one on the left, bevelling of the inner plate is plainly marked. In that on the right, the depressed pieces of bone formed an irregular cone which pressed on the *dura mater*. (Author.)

2. A man assaulted his wife, and stabbed her several times in the back with a knife, while she was carrying her child. In the struggle, when the woman was

attempting to run away, the infant fell or was dropped by her on the pavement. We found the following fractures on the child's skull: (*a*) a fracture on right side 4 inches in length; (*b*) in occipital bone and extending to left side of head, a linear fracture of 3½ inches in length. The brain was much lacerated, and brain tissue had escaped from cavity of head into a hæmatoma on right side of head. He was found guilty. (Fig. 65.)

3. On the body of a newly-born child, found on the banks of the river Kelvin, Glasgow, was a fracture in the left parietal region of the skull which measured 3½ inches in length; between the cranial bones and the *dura mater*, much extravasated, clotted blood was found. (*Vide* Fig. 45.) The child had freely breathed.

Of fractures of the skull generally, it may be said that where heavy bodies suddenly strike or are propelled against the vertex of the skull, the line of fracture will be determined by the resultant of the lines of force and of resistance. The force being one of compression, acting in the direction of the line of impact compresses the skull and its contents in lateral directions thereby producing points of distension, due to resistance, their line being at right angles to

FIG. 65.—Fractures of Skulls of Infants. The one on the left was caused by a poker, the other by a fall from the arms of the mother while running.

the line of force, at which points the fractures take place, and at which the separation of the fractured surface is greatest; and from these, radiating toward the point of impact, and oppositely to the point of distension, run the lines of fracture. Where the force is applied laterally, it will depend upon the relative values of the force and the resistance, whether the fracture occurs at the point of impact—where the force is relatively much greater than the resisting power, as in the case of a pointed instrument—or at the opposite side of the head by *contre-coup*, where the resistance being relatively more equal to the force, the area of greatest distension falls upon the side opposite to that of the applied force, and thus produces a fracture, or, it may be, laceration or contusion of the brain-surface without fracture of bone. The part of the skull which, on the application of force, seems to us to fracture most easily—because it is usually the thinnest part of the skull—is the squamous portion of the temporal region, above the level of the articulation of the lower jaw and in front of the ear. These are but general observations which, however applicable they might be in a case of fracture if all the factors were known as a

mechanical problem, fail in their practical application in most cases, because of the absence of that very knowledge.

Penetrating wounds of the abdomen may be homicidal, suicidal, or accidental; but they are more generally homicidal. Danger to life arises from three main causes, viz.: shock, wounding of intestines or other organs, and septic absorption and peritonitis. By reason of the comparative thinness of the abdominal wall, it is often difficult to say what are the internal injuries. This difficulty is, perhaps, greater in gun-shot wounds than in others, but it is not little in any case. Where sharp-pointed instruments have been used and the instrument itself can be examined so as to ascertain the greatest depth it could reach, that point and the symptoms will assist in forming an opinion of the gravity of the wound.

Mr. Mayo Robson reports[1] a case of penetrating abdominal wound occasioned by accident, in which the sharp end of a file, without a handle, having been caught in the revolving wheel of a lathe, was pushed through the clothes of a young man into the abdomen, but from the effects of which, with appropriate treatment, he recovered, although when seen at first he had all the symptoms of internal hæmorrhage and shock. Another case, with protrusion of the injured intestine produced by the goring of a bull, is recorded.[2]

Ruptures of internal organs may be produced from violence by a blunt instrument being applied externally, and, as has been pointed out, without any visible external mark of violence.

But abdominal wounds may be inflicted upon females by the forcible introduction of instruments *per vaginam*.

At the Liverpool Assizes, March 1896, a man was arraigned before Mr. Justice Kennedy on the charge of murdering his wife by plunging an instrument into her abdomen by this channel, and by otherwise assaulting her.[3] Post-mortem examination of her body showed between forty and fifty recent bruises on the limbs, and four wounds in the vagina. Three of these wounds could admit the little finger, and the fourth was much larger. Two of them entered the peritoneal cavity, and there was evidence to show that the point of the instrument had reached as high up as the pyloric orifice of the stomach. The medical witnesses for the Crown were of opinion that the internal injuries were caused by a poker, and that it was physically impossible for them to have been self-inflicted. The medical witnesses for the accused affirmed that they might have been, and possibly were, self-inflicted in the effort to procure abortion, as the deceased had stated to a female witness that she would take care that she should have no more children. This, coupled with the fact that the deceased was of intemperate habits, doubtless enabled the jury to return a verdict of "not guilty." See also page 168.

On the whole general question of wounding with respect to accidental, suicidal, or homicidal causation, it may be said that the field is too wide, both as to kinds of wounds and as to surrounding circumstances, to permit of the statement of such guiding principles as might be of absolute value to the student. It is in this particular that the powers of observation and logical faculties of the observer are most brought into play, and in the ratio in which he is able to display both will he be likely to prove helpful to the criminal authorities, and more especially, where the evidence is purely circumstantial. But in this last-mentioned contingency it behoves him to proceed to his conclusions with caution,

[1] *B. M. J.*, vol. ii. 1897, p. 76. [2] Idem, 1898, p. 897.
[3] *The Lancet*, vol. i. March 28, 1896.

since circumstances are apt at best to prove deceitful and delusive. It is more satisfactory for the purposes of retributive justice that a suspected person should receive the benefit of any doubt than that an innocent person should suffer; therefore, while facts may point to certain logical conclusions, it is better not to unduly press them. It hardly requires special training in certain cases to divine the causal relationship of such a case as the following, where a man clambers on to a roof, rests against the chimney-head, there deliberately cuts his throat, and then falls in a dying condition into the public street, since the facts unmistakably point to suicide while in a condition of insanity; on the other hand, it does require the exercise of all the powers of observation to be able to say, when, in a room with the door locked on the inside a body is found with wounds upon it which point more likely to homicide than suicide, to which category it belongs, since both murder and suicide have been committed under such circumstances, the murderer in the former case entering and leaving the apartment by the window, to which he had ascended by the aid of a convenient water-pipe. Nor is it difficult to say in a case in which a dead body is found with a wound or wounds upon it, and in the hand of which a weapon is found firmly grasped, that death is due to suicide; or where two bodies are found marked with woundings, in the hand of one of which a weapon is present, that we are dealing with a case of murder and suicide. But beyond such cases there is a large class in which the medical evidence derived from examination of the body is simply corroboratory of the crime as beheld by eye-witnesses, compared with which the class of cases in which the medical evidence is of chiefest importance is but small. There are strange vagaries in suicidal woundings. In some cases, unless the fact of suicide had not been known as certain, the magnitude of the injuries found upon the body would point to accident or homicide as the more likely cause; for example, where a man puts a quantity of blasting gelatine in his clothing, or dynamite into his mouth,[1] deliberately explodes it, and is blown to pieces; or, as in a case reported from Milwaukee, where a man makes a small cannon, charges it with bullets and powder, places the muzzle to his abdomen, fires it, and is blown almost in halves; or where suicides precipitate themselves from a height, or down pit shafts, or before a railway train. Where the suicide is the outcome of suicidal mania the woundings are often very shocking. An extraordinary case occurred in the Glasgow Lunatic Asylum, Gartnavel,[2] where a patient with a hammer and spike so battered his head that the brain-substance protruded; but he recovered, apparently little the worse: in another case, a man drove a dagger through his skull into the brain with a mallet, and succeeded in driving the weapon practically up to the hilt. He also recovered.[3]

Some words must be said respecting the diagnosis of suicidal gunshot wounds from marks of scorching, smoke, or engraining or tattooing with particles of unconsumed gunpowder. While some, or all, of these signs may be noted—indeed, are likely to be seen—in wounds fired at

[1] *B. M. J.*, vol. ii. 1881, p. 159; *Med. Press and Circular*, vol. i. 1887, p. 80.
[2] *Glasgow Med. Journal*, 1858.
[3] *The Lancet*, vol. ii. p. 845.

close distances with cartridges containing black gunpowder, it ought to be borne in mind that, by the use of smokeless powder in modern cartridges, such marks as are due to the imperfect combustion of the black powder will be awanting. Major Blenkinsop, A. M. C.,[1] has recorded three cases of suicidal gunshot wounds in which small-bore rifles—Lee-Metford—bullets of small calibre, and cordite powder were used, and in which the missile in each case was fired at close distance. In none of them was there any blackening or charring or tattooing of the tissues in the neighbourhood of the wounds. The recorder adds that where cordite ammunition is used it is no longer possible to judge the distance of the part struck from the point of firing, by reason of the absence of the above markings.

Therefore all that can be said is, that the whole circumstances of the wounding, and the environment of the body when found, must be completely observed, considered, and weighed, before a pronouncement of opinion is made with respect to accidental, suicidal, or homicidal causation.

[1] *B. M. J.*, vol. i. 1900, p. 434.

CHAPTER XI.

BLOOD-STAINS, AND EXAMINATION OF BLOOD.

Closely associated with the subject of Wounds is that of blood-stains. As has already been pointed out, in every case in which a dead body with wounds upon it is examined *in situ*, examination should be carefully made for the presence of blood-stains and their incidence upon the body and in its vicinity, within or near the place in which it is found. The examiner must expect to meet with every possible variety of stains, both in respect of character, incidence, and magnitude; as (*a*) sprays, spirts, or jets; (*b*) smears of various forms; or (*c*), pools of blood.

The relation of the direction of a spray of blood to the position of a wounded body when found, and the presence of such in the vicinity of the body or the place where the body is found, ought to be carefully noted on a rough plan sketched upon the spot, after measurements have been duly taken, because such may indicate the position of the person at the time of wounding, or the place where a given wound might have been caused. The cases already narrated illustrate these points. This is especially important where, in a charge of homicidal assault, a plea of accident is set up. In a case recorded by Ogston,[1] he was able to locate the place where the violence had been offered, although the body was found in a field about thirty yards away, by the fact that on the side-posts of the door of the house and on the wall-plaster adjacent, he found jets of blood at a height of four or five feet from the ground. The attack had been made by a weapon, such as the back of an axe, and although the victim had died at the spot where the body was found, judged by the large quantity of blood found, it was evident that he had been able to flee from his adversary before succumbing to the effects of the violence. In the cases already given (pp. 213, 216), it was quite evident that in the former, the only place where the only wound found on the body could have been produced was the wooden facing of the window of the bedroom, and in the latter that the violence had been inflicted upon the victim while her assailant, chasing her round the apartment, was battering her head and face with a brick. In the examination of blood-stains on wood or on any other surface, any hairs or other substances present ought to be taken possession of for future examination, as they may prove of value in elucidating certain points. Loudon[2] affirms that with some experience it is not difficult to differentiate between the hairs of Man and those of the lower animals, nor even to decide to what species of animal a given specimen belongs. This we can corroborate; but it

[1] *Op. cit.* p. 468.
[2] *Archives d. Sciences Biolog.*, vol. vii. No. 2.

can only be accomplished after careful and deliberate study of a great variety of different animals' hairs. He declares that if a hair-bulb has been forcibly extracted, the bulb will be irregular, will possess an undulating surface, and will show excrescences of different shape and thickness; and that a naturally-shed bulb will be small with a rounded extremity, and will have a smooth surface. On the other hand, in addition to the appearances microscopically of the bulb itself, we attach more importance to the condition of the sheath of the bulb. In a forcibly-plucked bulb the sheath will be found ruptured, as shown in Fig. 50. Hassall[1] gives a drawing

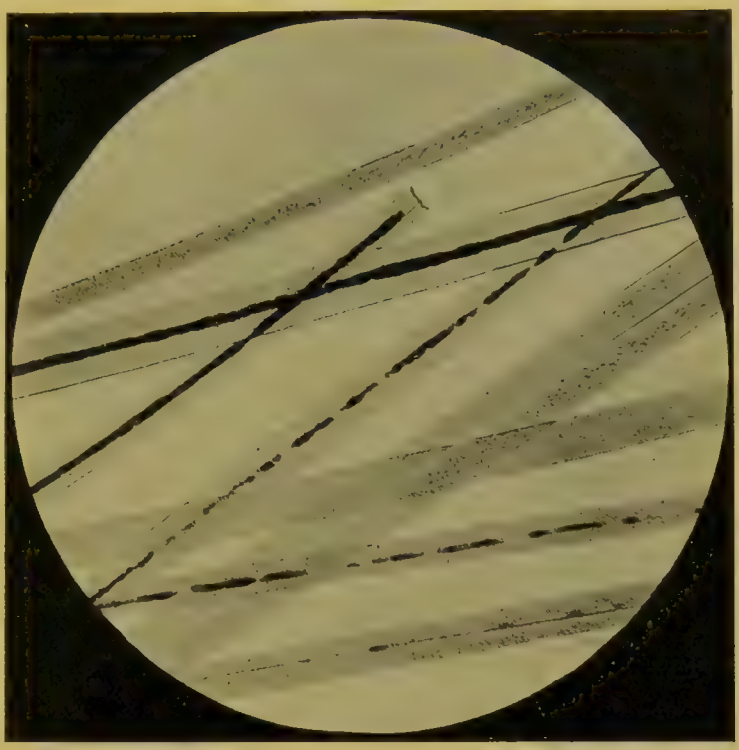


FIG. 66.—Photo-micrograph of Human Hair becoming Grey from Age. Pigment is disappearing from medulla. × 500 diameters. (Author.)

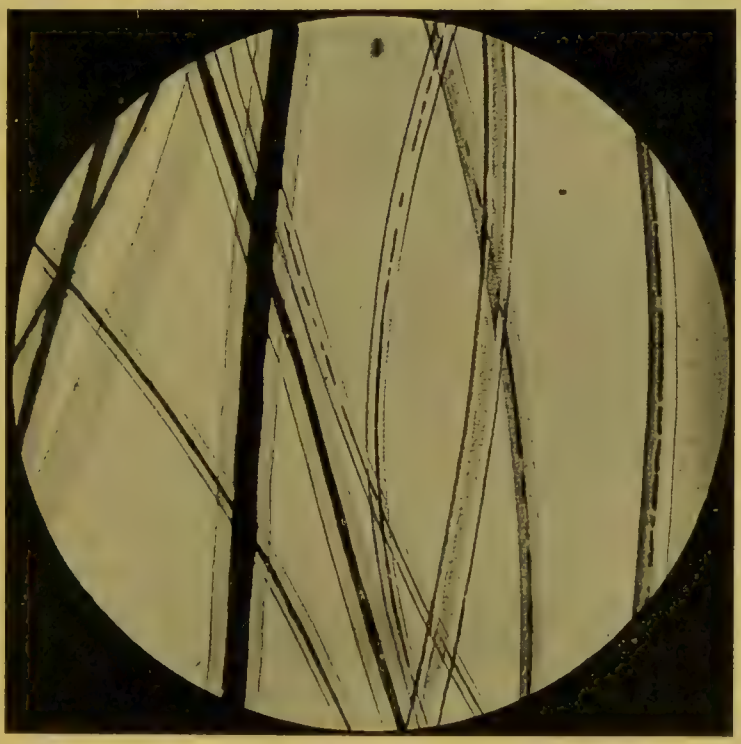


FIG. 67.—Photo-micrograph of Hair of Polar Bear. × 500 diameters. (Author.)

[1] "The Microscopic Anatomy of the Human Body," vol. i. Plate xxviii.

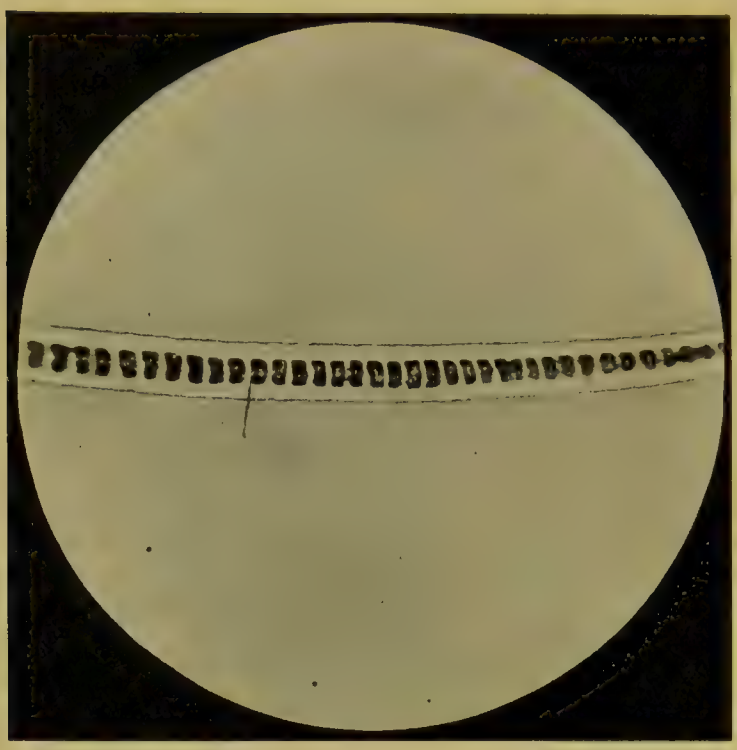


FIG. 68. — Photo-micrograph of a Hair of the Rat; magnified 500 diameters. (Author.)

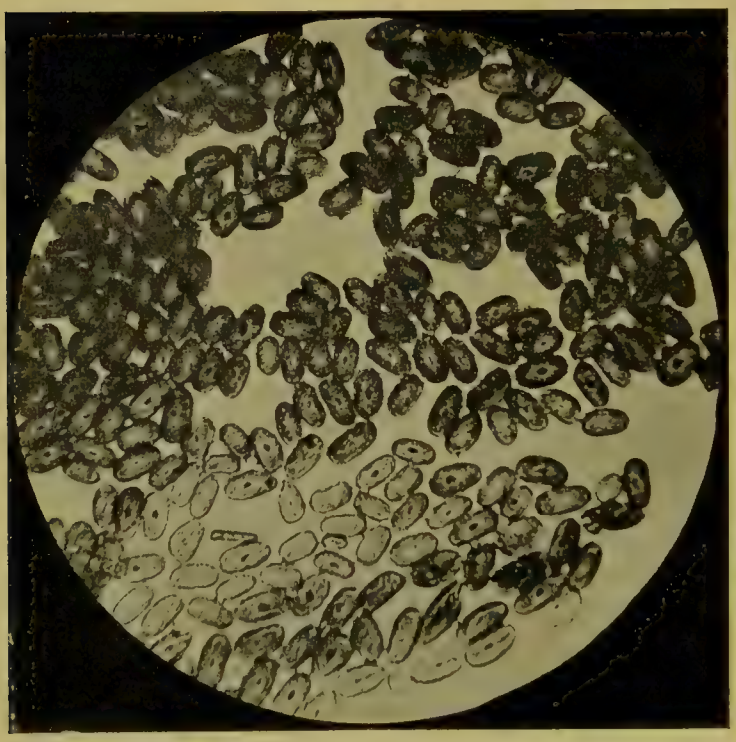


FIG. 69.—Photo-micrograph of Cross Sections of Human Hair, showing pigmented medulla. × 500 diameters. (Author.)

of the sheath of a hair which was forcibly extracted, which shows the rupture of the sheath as seen in the above figure. It ought to be noted that polarised light is absolutely necessary to distinguish fine differences in hairs. So, likewise, bloody footprints, or footprints in blood, ought to be carefully measured in view of the possible raising of questions having reference to the identity of an assailant or assailants. This question, however, rises to higher importance, probably, in the detection of blood-stains upon clothing or other fabrics, weapons, leather, plaster, or wood, for in this way a suspected person may occasionally be associated with a given crime, while the evidence, otherwise, is circumstantial.

The colour of blood - stains varies, and de-

pends upon a number of circumstances, the principal of which are the following, viz. :—

1. The age of the stain.
2. The amount of blood composing it.
3. The nature and colour of the material upon which it has been effused.

Generally speaking, recent stains are reddish in colour, old stains, brownish. On certain cloth-fabrics, stains of blood are less visible in daylight than by artificial light, as, for example, on brown, blue, and dark-coloured stuffs generally; whereas on others, they are best seen in good daylight, as on light-coloured fabrics, on leather, wood, iron, or stone. By reason of their albuminous composition, blood-stains, when dry, impart a stiffened or starchy feel to thin fabrics, such as those composed of cotton, wool, silk, or linen; and even on thick worsted or woollen tweed-stuffs, blood mats together the fibres, as seen through a hand-lens. On iron, steel, or metal generally, they look like dark, shiny spots or smears, and when desiccated, are often found fissured or cracked.

EXAMINATION OF BLOOD-STAINS.

What course ought to be systematically followed in the Examination for Blood-stains, and in the Identification of coloured stains with Blood? In the first place, caution and carefulness must be exercised throughout the whole inquiry, for, if possible, and an opportunity offers, a guilty person will attempt to wash away the evidences of his guilt. In the examination of clothing, therefore, it is very necessary to examine especially those parts of the clothing which are most likely to be overlooked in the cleansing process, or those parts of articles of attire which may entirely be overlooked, such as seams of clothing, soles of boots, etc.

A. **Physical Examination.**—Given, then, certain spots or marks of stains on cloth-stuffs which may be blood, the following is the course which ought to be pursued in their examination :—

I. Examine them critically with a good hand-lens. By this means, matting of fibres, or even minute coagula may be discovered.

II. Note accurately the positions on the garment of the stains examined.

III. Cut out the piece of cloth on which the stain is found (or, where several stains are found, some of the stains), for the purpose of noting the solubility of the colouring-matter in a solution composed of water and some other substance. It is always advisable, where multiple stains are found, to leave some of them untouched for the use, it may be, of another examiner. The solubility of a blood-stain depends upon two main factors, viz. (*a*) the composition of the stain in respect of its age, and (*b*) the material upon which it is found. The following general proposition may be affirmed: the more recent the stain, the greater its solubility; and the converse is equally true. In recent stains, the hæmoglobin is more or less soluble, but in very old stains, solution is not effected, because

the soluble hæmoglobin has been converted into insoluble hæmatin. In trying to obtain a solution of the blood-stain, the object is not to obtain a coloured solution for chemical and spectroscopic purposes only, but, if possible, to obtain the contained corpuscles for microscopic examination in as natural a form as possible, so as to identify the class of animals to which the corpuscles belong; therefore, the solvent used should simulate as nearly as possible the specific gravity of the *liquor sanguinis*. The best solvent for this purpose is one composed of seven parts of water and one part of glycerine (sp. gr. 1030), Pacini's solution which is made up of one part of chloral hydrate dissolved in ten parts of water, or normal saline solution. Where water alone is used the corpuscles appear swollen like globules, due to endosmosis, because of the water being less in specific gravity than the serum of the blood; where, on the other hand, a solvent of higher specific gravity than that of the serum is used, the corpuscles appear misshapen, crenated, or punctated at the edges, due to exosmosis.

Stains may have to be examined upon any of the following substances, viz.:—

1. Cloth-fabrics.
2. Wood.
3. Plaster.
4. Metal.
5. Leather.

The following procedure, in respect of each, is recommended, in order to obtain a solution, if such be possible.

I. *Cloth-fabrics.*—Cut out the stain, moisten it in one of the foregoing solvents, and assist maceration by gentle bruising of cloth with a piece of glass rod. This procedure is applicable to large stains; but where the stain is small, and the quantity of colouring matter available is also small, it may be necessary, after moistening the stain in the solvent, to squeeze out with flat-pointed forceps tiny drops on a series of glass slides for examination by the microscope, and to reserve the remainder for the spectroscopic test. In dyed fabrics, the mordants used may so fix the blood-stain that solution fails, and this is especially true when it has been attempted to wash away the stain with soap and water. To obtain a blood-solution in such cases, it is necessary to digest the cloth in either a weak solution of citric acid or of ammonia—which of them can be ascertained by parallel experiment—when the blood-colouring matter will readily yield to solution.

II. *Wood.*—Cut off a thin shaving of the wood, noting, if possible, the kind of wood, especially if oak or elm, and treat the stain, if on ordinary wood, with the solvent, but if on oak, with a 2 per cent. solution of hydrochloric acid. The reason for this will be discussed later.

III. *Plaster.*—Scrape off plaster with stain, and proceed as for cloth or wood.

IV. *Metal.*—If on a clean, unrusted weapon, and the stains are

thick like a spot of dried jelly, then gently heat, over a spirit flame, the opposite side of the blade to that upon which is the stain, when, if the stain be recent, it will probably peel, curl up, and fall off, or may be easily loosened. This must be done with great care. But the same end may be attained without the risks attending the foregoing, by scraping the stain into a watch-glass. Where the stain is thin, or mixed with rust, scraping is the only available method for detaching it. Where the weapon is rusty, or the stain is apparently mixed with rust, a preliminary test, based upon the behaviour of blood toward hydrogen peroxide, may be employed to a small corner of the stain. An account of it is given by Ganttner,[1] and it may, therefore, be called by his name. The test, which we have corroborated several times on old rusty instruments known to be blood-stained, is best carried out thus: it may be performed on the weapon itself, or, better, if the weapon has to be more fully examined, by scraping off a part of the rusty deposit into a watch-glass, placed on top of a piece of black paper, then to drop on the scrapings, after adding a drop of water made feebly alkaline, a tiny drop of hydrogen peroxide, and watch the result. If blood be present even in the slightest trace numerous comparatively large bubbles of gas are developed, which, gradually becoming more numerous, give a white, beady appearance to the surface of the material. According to Ganttner, this frothy appearance develops from the outside of the drop toward the centre. But this is only seen where the scraped material is mainly composed of blood. Where the rust only contains blood in some of the particles, the gas only shows in those particles which contain blood. There is little fear of mistaking this frothy appearance for air-bubbles, but lest this might be a source of confusion, it is better, after adding the alkalinised water, to dissipate any air-bubbles which may form round the particulate matter with a piece of sharp-pointed glass rod, and thus have the mixture clear before adding the hydrogen peroxide. Should the above reaction not take place on the addition of the peroxide, then it can safely be affirmed that no blood is present. It is, therefore, an excellent negative test. But it is not an equally safe positive test of the presence of blood, because other fluids of the body when mixed with rust, such as saliva or pus, give equally well the same reaction; so that other tests, such as Teichmann's, must be applied to another portion of the scrapings, in order to obtain, if possible, hæmin crystals. The age of any stain, however, is no bar to its employment from the negative side, but where response is given to the test, positive proof of the presence of blood must be given in other ways, as that of Teichmann, or by the spectroscope.

[1] *Zeitschrift für Anal. Chem.*, 1895, Zweites Heft, pp. 159–160; also *The Analyst*, vol. xx. p. 186.

V. *On Leather.*—Special care must be exercised in the examination of stains upon this medium, owing to the fact that the tannic acid in the leather forms a compound with blood which is insoluble in either of the solvents named; and for the same reason, this applies to oak, or any other wood, which contains much tannin. But if a long, thin shaving of the leather bearing the stain be sliced off with a sharp knife, and the shaving be doubled so that the stain is upon its convex side, and if the surface of the stain be made just to touch the water-glycerine solvent without coming in contact with the leather, a coloured solution may be obtained if the stain be recent. Should this fail, Sorby recommends that the leather-shaving should be placed in a small quantity of a 2 per cent. solution of hydrochloric acid in water—no more, and no less.

B. **Chemical Examination.**—Having obtained a coloured solution, to a certain portion of it, depending upon the total quantity at disposal, certain chemical tests should be employed, viz.:—

1. To a small portion of the coloured fluid, add a drop or two of a weak solution of ammonia and water. If the colour be due to blood, it will either become slightly more red, or it will remain practically unchanged. If, however, it be due to the red juices of fruits or jellies, or jams, the colour will be changed to green, and if due to logwood, madder, cochineal, or Brazil wood, to crimson in colour.

Note. If the ammonia used be too strong, a brown colour may be produced in the case of blood.

2. To a second portion, apply heat to boiling, when the following three changes will happen, if it be due to blood:—
   (*a*) The colour disappears.
   (*b*) The colour becomes milky from coagulation.
   (*c*) A precipitate falls, which may vary in colour from a dirty-grey to brownish, depending upon amount of blood-colouring matter present.

   To the precipitate add Caustic Potash and apply gentle heat, when the precipitate will dissolve, and the resulting solution will show a different colour depending upon whether it is viewed by transmitted or by reflected light. This phenomenon is called the *dichroism* of the blood. Respecting the colours as seen, authorities differ: some declare that the colour by reflected light is green, and by transmitted light, red, while others affirm the opposite. As a matter of fact, the phenomenon is chameleon-like as regards colour, so that both sets of observers may be considered right or wrong.

3. To a third portion, add a drop or two of fresh Tincture of Guaiacum (upon which the fluid will become white owing to the deposit of the guaiac resin by the water of the solution) and, thereafter, a few drops of ozonised ether or turpentine, or peroxide of Hydrogen, when, if blood be present, a blue colour more or less marked, depending upon the amount of blood-colouring matter present, will develop at the junction of the fluids. This colour may vary from a very pale shade of blue to a distinct sapphire blue.

   This test is known as Day's test, from Dr. John Day of Geelong, or Schönbein's test, from this observer having proposed its use for this purpose in 1861. There is no other coloured substance which gives this reaction, and this test, moreover, is an exceedingly delicate one.

4. Concentrate a portion of the coloured solution, place a drop upon a microscopic slide, add and mix a drop of glacial acetic acid and a tiny crystal of chloride of sodium, beat gently to dryness, and examine, thereafter, microscopically; if blood be present, crystals of hæmin, which is the hydrochloride of hæmatin, will be found, which may vary in colour from faint yellowish-red to brownish-black, and which may be rhom-

boidal, or six-sided in shape, and may be found in clusters, as separate crystals, or in masses. This is called Teichmann's test. The formula for hæmin, according to Mörner, is (C_{35} H_{35} N_4 Fe ClO_4). It is well to verify the crystals as those of hæmin, which may easily be done by placing over them a tiny drop of hydrogen peroxide, upon which the evolution of gas-bubbles of oxygen will take place, as already described. (Fig. 70.)

C. **Spectroscopic Examination.**—To a second portion of the coloured fluid, the spectroscopic tests should be applied.

Before doing so, however, there are two or three points respecting the nature of the blood-colouring matter with respect to its varied states of oxygen-combination, which must be stated for the clear comprehension of what is to follow:—

1. The colouring-matter of fresh blood is called *hæmoglobin*, and we may leave out of count the name *cruorine* which Stokes gave it. It may exist as

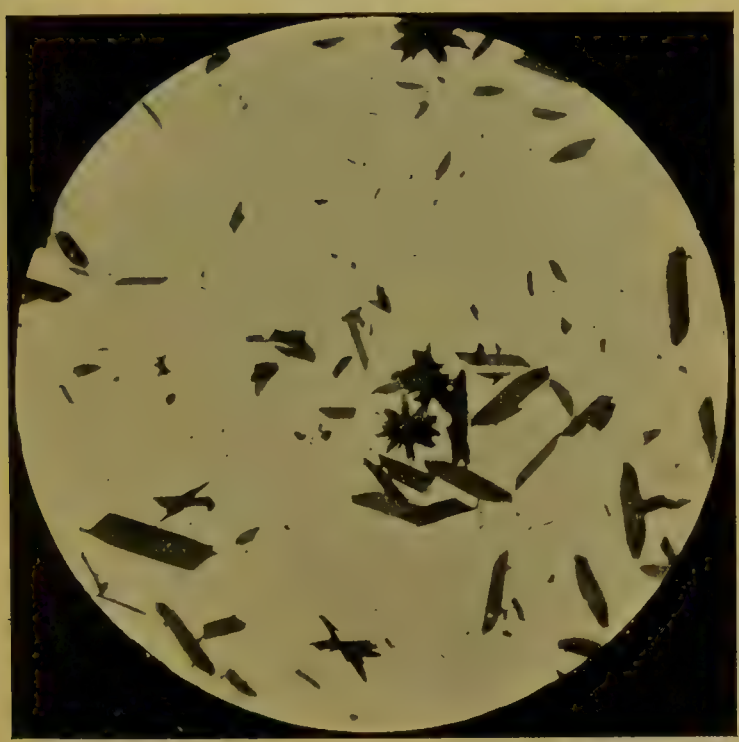


FIG. 70.—Photo-micrograph of Crystals of Hæmin. × 500 diameters. (Author.)

oxidised hæmoglobin, as in arterial blood, or blood which has been exposed to the air, or as deoxidised hæmoglobin, as in venous blood, more especially when taken, under certain precautions against aëration, from the heart cavity of an animal newly asphyxiated.

2. If the stain has become dry, as it is likely to do quickly upon various media, and if it has been exposed to an atmosphere in which the products of coal combustion are present, the hæmoglobin becomes changed into *met-hæmoglobin*, a body which seems to be composed of hæmoglobin and loosely-combined oxygen, and which may be considered as the first stage of the hæmoglobin-deoxidising process. This conversion does not take more than a few weeks at the outside, under the circumstances named.
3. If the stain has been kept damp, by lying in a damp place, it becomes gradually converted into *hæmatin*, which, according to Nencki and Sieber, has the chemical formula (C_{32} H_{30} N_4 FeO_3).

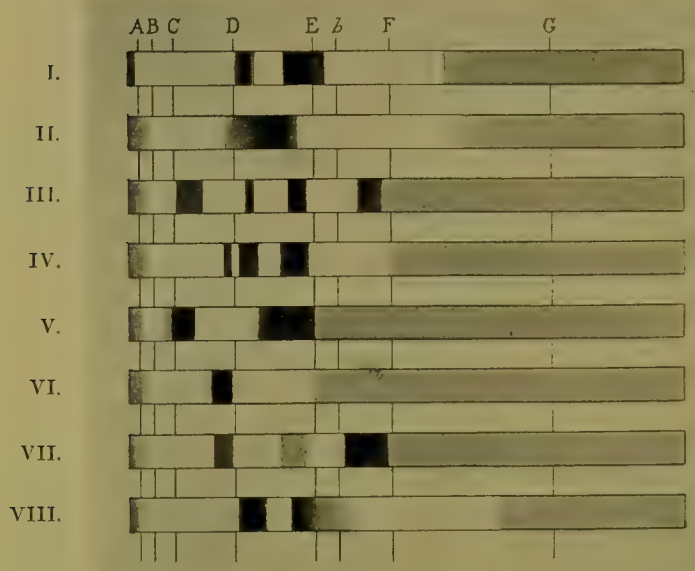
4. Under any circumstances—taking longer, however, when the stain has been kept dry—the hæmoglobin becomes sooner or later converted into hæmatin.

On examination of any given sample of blood from a stain, therefore, difference in spectrum will be found, depending upon the precise condition of the colouring-matter of the blood of the stain and the solvent used; in other words, the number and position of the bands in the spectrum may be different. The following spectra are characteristic of the principal states of the blood:—

1. Of Oxidised or Scarlet Hæmoglobin—

   Two bands in the yellow half of the green, the one at the violet end twice as broad as the other; or, more scientific-

Fig. 71.—Blood Spectra.



I. Oxidised Hæmoglobin or Oxy-hæmoglobin.
II. De-oxidised Hæmoglobin or Reduced Hæmoglobin.
III. Met-hæmoglobin.
IV. Alkaline Met-hæmoglobin.
V. Acid Hæmatin.
VI. Alkaline Hæmatin.
VII. Sodium-Fluoride Hæmoglobin.
VIII. Carbonic Oxide Hæmoglobin or Carboxy-hæmoglobin.

   ally, there are two distinct bands between the Fraunhofer lines *D* and *E*, the one nearest *D* being about half the breadth of the other and more defined;

2. Of Deoxidised or Purple Hæmoglobin—

   One single broad band in the green; or one broad band between *D* and *E*;

3. Of Blood, after short exposure to air—a mixture of HbO and Met-hæmoglobin;

   Two bands as in (1), but less marked, with the addition of a third band in the red;

4. Of Blood, after long exposure to air—chiefly Met-hæmoglobin;
   The bands are as in (3), but the band in the red becomes more marked, and the two in the green less marked;
5. Of Blood, after long exposure to air, with Ammonia added—alkaline Hæmatin;
   The band in the red disappears, those in the Green become more pronounced;
6. Of Blood as in (5), but with addition of Citric Acid, and without Ammonia—acid Hæmatin;
   A broad band appears in the red, and a second in the green.
7. Of Blood with Carbon Monoxide—
   Two bands as in (1), but nearer violet end of spectrum.

The only spectra which may be confounded with those of blood are those of certain vegetable colouring matters, but, fortunately, they can easily be differentiated by chemical means. Of these vegetable colouring matters, the principal are the following:—

1. Cochineal in alum, which gives two bands as in oxidised hæmoglobin, but on adding boric acid to the solution the bands move into the violet end of the spectrum, while those of blood similarly treated, remain unchanged.
2. Lac-dye, alkanet root, madder, and others give spectra which, in some measure, resemble those of blood, but they are entirely altered, or removed altogether, by the addition of ammonia or potassium sulphite, while those of blood, treated likewise, are unaltered.

The spectroscope, therefore, is the most reliable test for blood, as it is capable of detecting the $\frac{1}{1000}$th part of a grain of hæmoglobin. In cases in which a stain upon any of the media formerly named, with the exception of leather or woods containing tannin, will not yield a coloured solution by the treatment already detailed, it is advisable to add a few drops of dilute ammonia, when, if the insolubility has been due to the colouring-matter being in the condition of hæmatin, it will now dissolve, and thus a solution available for testing is obtained. In certain cases it is advisable to filter the solution, especially when it contains particulate matter such as rust, ordinary dirt, or like substances; if, however, the solution obtained be fairly clear, it will be quite suitable without filtration for spectroscopic examination. The technique of the examination, however, will depend upon the amount of blood-stain, and, therefore, the amount of coloured solution at the disposal of the examiner. If the amount be sufficient to yield about half an ounce of coloured solution, then the spectroscopic examination may be quite easily conducted with the ordinary hand direct spectroscope and a flat glass cell; on the other hand, if the amount of solution be only one or two cubic centimetres, the examiner must then fall back upon the micro-spectroscope, by which he is enabled to examine minute quantities of solution. Regarding the technique of the former, no special explanation is necessary; but it is essential that something should be said concerning the latter, since it requires some measure of manipulative dexterity.

Probably the best micro-spectroscopes of to-day are those made by

Zeiss, Watson, Beck, and other makers, after the pattern suggested by Sorby. This fits into the barrel of the microscope made by the particular maker, but a junction tube can easily be obtained to unite the spectroscope and microscope where such have not originally been made to fit. The instrument consists of prisms arranged for direct vision which are placed in the eye-piece. These prisms are usually made of low dispersive power for blood-work, but the power of dispersion may be graduated by using different sets of prisms in different eye-pieces. Below the prisms is an achromatic lens, which is capable of adjustment by a rack-screw. The slit by which the spectrum reaches the eye from the object can be opened or shut by a screw, by means of which the better definition of the spectrum is secured. Arrangements are also provided in the instrument for a parallel spectrum, so that a second spectrum for comparison can be obtained at the same time as the other. This is effected by placing the substance, the spectrum of which is to be compared, on the stage with which the apparatus is provided. In the centre of this stage is an adjustable slit, behind which is a right-angled prism which throws the second spectrum into the field of vision parallel to the other, and thus comparison may be made. In using the micro-spectroscope, the eye-piece of the microscope is removed, the spectroscope is put in its place, and by means of focussing-screws the spectrum is thrown sharply into the field of vision. It is best to work with a low-power object-glass, in order to obtain satisfactory light.

FIG. 72.—Shows the Micro-Spectroscope fitted in microscope ready for work. In the front of the figure is a small direct-vision Spectroscope.

The micro-spectroscope manufactured by the Messrs. Beck differs from the foregoing type of instrument in that instead of being fitted in the place of the eye-piece, it occupies the place of the lens.

Apparatus required.—In addition to the microscope, into the eye-piece opening of which is fitted the spectroscope, the following apparatus is required, viz. :—

1. *Cells.*—These are usually made of barometer glass-tubing, of $\frac{1}{8}$th inch internal diameter, and of $\frac{1}{2}$ inch in length. But as these are difficult to keep in position when the combined instrument is canted for light purposes, we have had cells made of the above with a glass foot added for steadying purposes,

which have been found to answer every purpose much better;

2. *Platinum Spatulæ*, in the form of wires of two different thicknesses; in one of which the extreme end is hammered out into a shape like a miniature garden hoe, for the purpose of better mixing of reagents; and one of a loop ending, for the purpose of adding reagents.

Reagents.—The following in small stoppered bottles, which, like the foregoing, are kept solely for spectroscopic purposes, will be found useful, viz.:—

1. Dilute Ammonia, 30 per cent. solution;
2. Dilute Citric Acid, 60 grains to the ounce of distilled water;
3. Solution of Rochelle Salt, to prevent precipitation of Fe_2O_3;
4. Dilute Hydrochloric Acid, 30 per cent.;
5. Dilute Boric Acid;
6. Dilute solution of Sodium or Potassium Sulphite;
7. Fresh Ammonium Sulphide;
8. A solution of $FeSO_4$ in water, to which Tartaric Acid has been added and then rendered alkaline with Ammonia (Stokes' solution).

If the stain is recent—as evidenced by its ready solubility—the colouring-matter will likely be present in the watery solution as oxy-hæmoglobin. Therefore, the spectrum of that substance will be visible. If, then, a loopful or two of Stokes' solution, or ammonium sulphide, be added, this will be reduced to the condition of reduced hæmoglobin, as shown by the change in the number and position of the bands. If the solution in the cell, however, be stirred freely with the platinum hoe, the likelihood is that the contained fluid will become re-oxidised, and the spectrum of the former will re-appear; if, now, a loopful or two of dilute Citric Acid be added, they will again disappear, and the solution, where Stokes' solution has been used, will have become turbid; thereupon add some dilute Ammonia, when the solution will clear up and will give the spectrum of hæmatin. According to Macmunn,[1] this last reaction distinguishes blood from most coloured substances in that the latter, after having been changed by acids, are restored to their original spectrum by alkalies, whereas in the former, after like treatment, the spectrum is changed. One further change can be produced in the colouring-matter of blood, viz.: by adding to the solution, after the addition of the ammonia, a loopful or two of solution of iron sulphate, the hæmatin is converted into reduced hæmatin.

Where the stain is of some weeks old, and where it has been kept dry in a room in which the products of combustion of coal or gas are present, the colouring-matter is likely to be composed of a mixture of met-hæmoglobin, hæmatin, and of some other ill-defined colouring substance, probably due to a stage in the metamorphosis of blood-pigment into bile-pigment. The spectrum will therefore consist of one of those named in Nos. 3 or 4 of the previous list. If, then, dilute Ammonia be added to the cell, the red band will disappear, and the two bands in the green will become more marked.

[1] "The Spectroscope in Medicine," 1880

In the case where the amount of blood is exceedingly small, the spectra most likely to be observed are those: (*a*) oxidised hæmoglobin, and (*b*) deoxidised hæmatin. These spectra are absolute proof of blood.

To discover whether vegetable colouring matters are mixed with blood, or have formed stains alongside of those of blood—a possible contingency—the addition of dilute ammonia, boric acid, or sodium sulphite solutions will either change the position of the bands in the spectrum into those parts of the spectrum in which those of blood are never found, or will, by bleaching the colouring matter, destroy the bands altogether, whereas those due to blood will remain unchanged in position, although they may become fainter. The reader should consult Sorby's papers on this subject.[1]

In addition, however, to the condition of the blood-colouring matter relative to its state of oxidation, spectrum analysis may afford valuable information of the cause of death in certain cases, owing to certain more or less fixed combinations which take place between certain toxic substances in gaseous form and the blood-colouring matter. There are certain forms of death in which profound alterations occur in the blood-colouring matter, which can only be definitely ascertained by spectroscopic examination. In deaths from asphyxia, the blood, as has been pointed out, is usually dark in colour, and in death by carbon monoxide it is cherry-red in colour. Since death by asphyxia is essentially due to accumulation of CO_2 in the blood, it might be expected, *a priori*, that this gas should be discovered on spectrum analysis. If the blood of the heart be examined immediately after death from this cause, it is true that the spectrum will not be found that of oxy-hæmoglobin but of reduced hæmoglobin, showing that a combination has taken place between the CO_2 and the hæmoglobin by CO_2 being substituted for the oxygen. But in ordinary medico-legal practice, it unfortunately happens that before the arterial blood is examined, it has become again restored to the condition of oxy-hæmoglobin, and, therefore, no information is vouchsafed on this point. But the same objection does not apply where death is caused by the action of *carbon monoxide*, as this gas forms with the blood-colouring matter a much more stable and definite compound, which remains for a much longer period of time than that which usually elapses between the death and the examination of the body, and the resultant compound gives a definite and unmistakable spectrum, viz.: two absorption bands which in relative breadth correspond to those of oxy-hæmoglobin, but differ from the latter in their position in the spectrum, being nearer the violet end than those of oxy-hæmoglobin. This, however, would be too precarious a test upon which to base an opinion: therefore, further manipulation is necessary before decision. In the first place, the cherry-red colour of the blood itself is most striking. If a drop of blood be taken from the finger and mixed with 19 parts of distilled water, and if one drop of the cherry-red blood be similarly treated, a distinct difference is at once perceived, viz.: the former will have assumed a faintly yellow colour, but the latter will be of a pinkish colour. By examination of both in the spectroscope, two bands will be

[1] *Monthly Microscop. Journal*, vol. vi. 1871, p. 9.

seen in each, the relative position of which can only be ascertained by exact measurement. If to each a loopful or two of fresh ammonium sulphide be then added and stirred well, and the spectroscopic examination be repeated, it will be seen that in the former, only *one* band is now visible, whereas in the latter both bands retain their position. The non-reducibility of the blood indicates surely, therefore, the carboxy-hæmoglobin, which is the name given to the compound formed between carbon monoxide and hæmoglobin. In all deaths by this gas, no matter what its vehicle—coal-gas, water-gas, charcoal or lime-burning, or blaise-heap fumes—the above characteristic spectrum is found in the blood in the manner indicated. The reader is referred to a succeeding chapter for further and fuller discussion of this subject.

In like manner, sulphuretted hydrogen forms a compound with hæmoglobin, although more evanescent than that of the former, of which the spectrum is that of reduced hæmoglobin, with the addition of a third band in the red of spectrum, which has received the name of sulphhæmoglobin; and hydrocyanic acid and potassium cyanide, a compound called cyanhæmatin, which gives a single broad band not unlike that of deoxidised hæmoglobin, but different from it in that it is nearer the violet end of the spectrum, and in being more shaded on the violet side. If a reducing agent be added, two other bands appear, but nearer the violet end than those of blood. These results, however, have only been obtained in the laboratory by mixing the blood with the poison; they have never been obtained from the blood of a person who has been poisoned either with the acid itself or with its potassium salt; therefore, from the practical point of view, they may be ignored.

D. **Microscopic Examination.**—The next point in the inquiry consists of the examination for cells or corpuscles either in the coloured fluid itself, or in the residue where the fluid has been filtered. If the precautions formerly given have been observed, we may hope to be able, at least, on corpuscles being found, to state to which class of animals they belong. It is, however, difficult to conceive of conditions in medico-legal cases in which, by micrometric measurements of the corpuscles, the exact animal to which the corpuscles belonged can be certainly determined, although some would even dare to condescend upon such particulars. This would, in our view, be unwise, because it is unsafe; it is enough, in the present state of scientific knowledge and manipulation, to state the class of animal to which the corpuscles belong. The filtrate, or fluid, ought to be carefully examined also for other cell-contents and constituents, as epithelial cells, spermatozoa, or fragments of hair.

How to Differentiate between the Blood of the Lower Animals and of Man.—It must be clearly understood at the very outset that the present limits of scientific research do not enable observers to differentiate between the corpuscles of the blood of man and those of many of the other mammals, for although careful micrometric measurement may permit, in selected conditions, detection of differences sufficiently accurate to pronounce an opinion as to the animal from which the corpuscles have come, such conditions are rarely, if ever, met with in medico-legal practice. But while this is so, there are, at the same time, certain definite characteristics in the corpuscles of

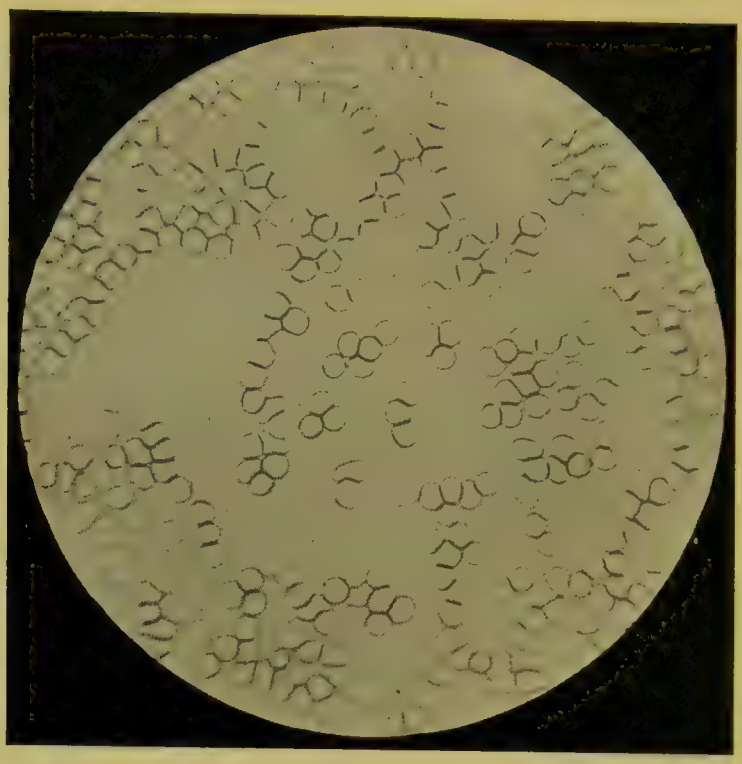


FIG. 73.—Photo-micrograph of Human Red Corpuscles—fresh, unstained specimen. The characteristic circular, bi-concave appearance is only apparent in some of the corpuscles, as pressure has distorted the others. × 500 diameters. (Author.)

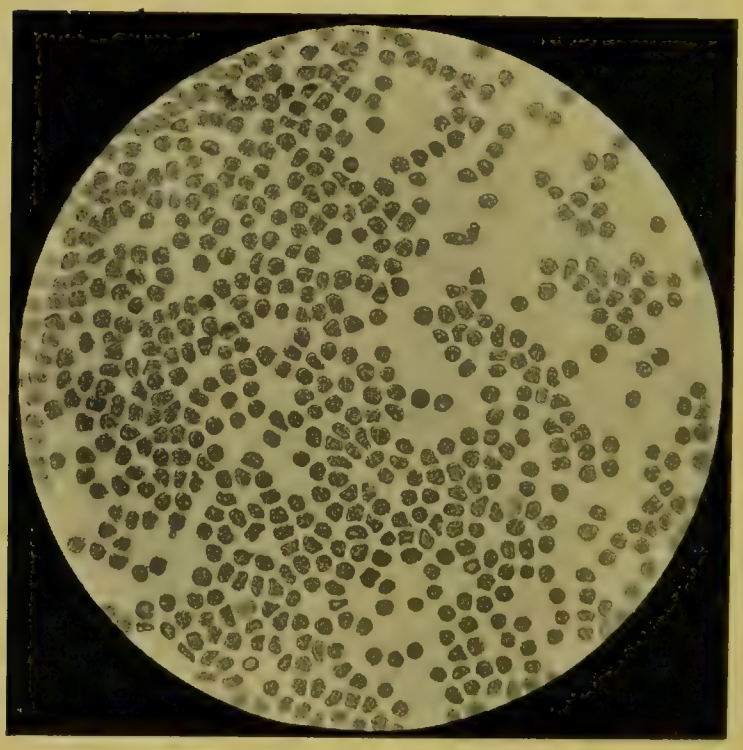


FIG. 74.—Photo-micrograph of Blood of Mouse. × 500 diameters. The field is too crowded to show uniformly the circular form; but it is observable in a few corpuscles. (Author.)

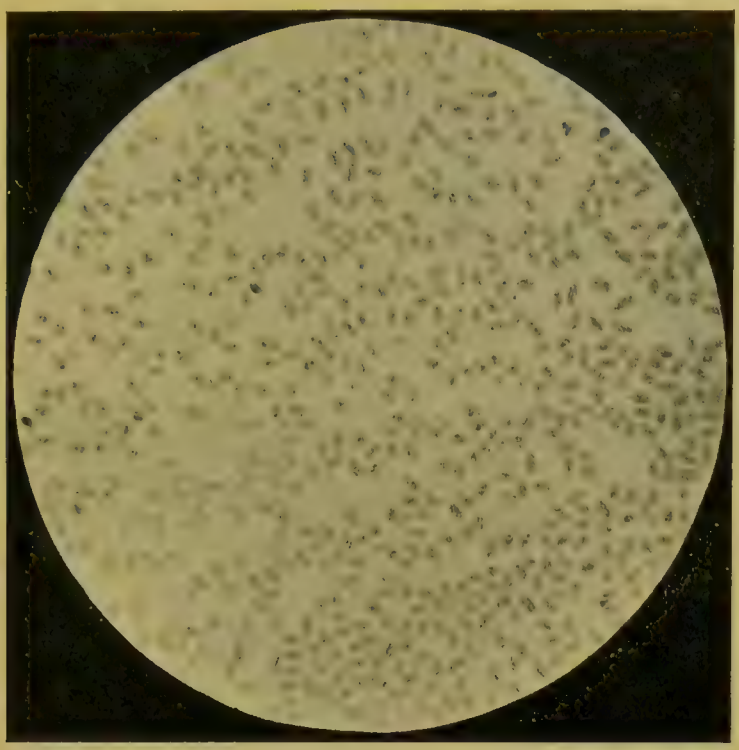


FIG. 75.—Photo-micrograph of Blood of Camel, showing oval shape and non-nucleated character of corpuscles. × 500 diameters. (Author.)

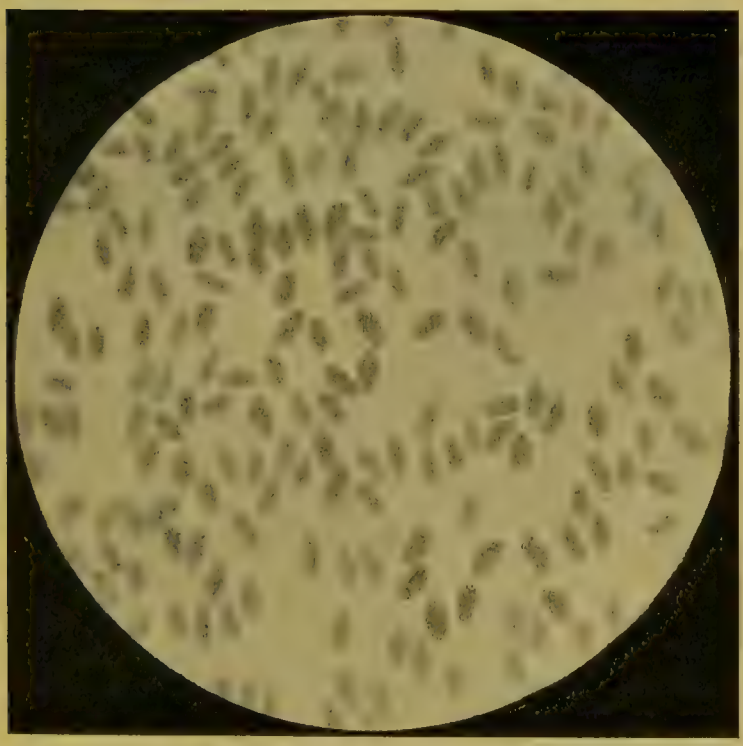


FIG. 76.—Photo-micrograph of Blood of Pigeon, showing oval-shaped and nucleated character of corpuscles. × 500 diameters. (Author.)

certain classes of the lower animals, and of a certain sub-class of mammals, which enable a distinction to be made by means of the microscope.

The following guiding facts, may, therefore, be set down :—

1. In man and in the large bulk of the animals of the mammalian order, the corpuscles are circular and non-nucleated. It will be well to state, however, that some observers affirm the existence of a nucleus in the corpuscles of this class, but this is contrary to the observation of most scientists.
2. In the camel tribe—the Camellidæ—of the mammalia, the corpuscles are *oval* in shape, and non-nucleated.

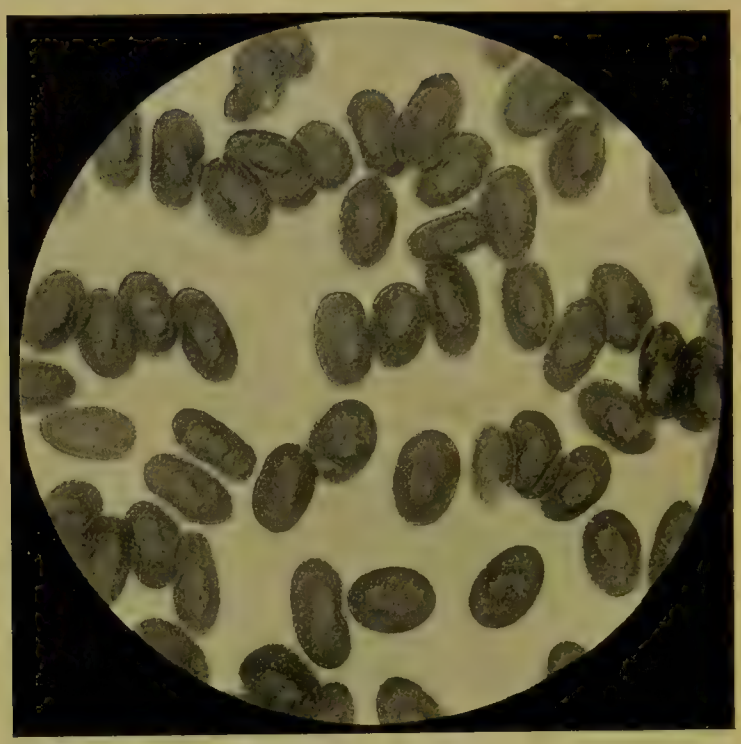


FIG. 77.—Photo-micrograph of Blood of Frog, showing oval shape and nucleated character of corpuscles. × 500 diameters. (Author.)

3. In birds, fishes, reptiles, and amphibians, the corpuscles are oval in shape, but contain nuclei.
4. The corpuscles of most of the domesticated animals—pig, ox, cat, horse, sheep, goat, and reindeer—are, on the average, less in size than those of man.

But although the facts stated in the last paragraph are true, they cannot be counted upon in medico-legal examinations of blood-stains, and therefore, the best positive answer which ought to be given to the question, Are the corpuscles those of man? is that they either conform to the characters of mammalian blood, or that they do not. The answer may, however, be of great negative value where, from the corpuscular characteristics of a given stain, it can be definitely affirmed that the blood discs are not mammalian, and therefore, are not those of

In See Lumphrey corpuscles.

/ see corpuscles of dog

human blood. The question of identity of corpuscles arises frequently in medico-legal cases. We have had to give opinions in two cases, in both of which the blood was mammalian. In a case tried at the Essex Assizes in 1851, it was pleaded of certain incriminating stains on the clothing of the accused that they were caused by killing a fowl, but microscopic examination disproved the averment by showing that the corpuscles found in them belonged to the mammalian class, and not to the class of birds.

In certain cases of alleged rape, it may become a question of importance whether the blood-stains found on the underclothing of the female alleged to have been assaulted are the result of hæmorrhage from violence to the sexual parts, or of the ordinary menstrual flow, or of menorrhagia. In our view, the answer to this question will depend more on the presence or absence of any breach of continuity of the parts from which the blood could be effused than upon the characters of the blood itself, for although menstrual blood contains no fibrin, has an acid reaction due to the vaginal mucus which keeps it fluid, and, moreover, contains squamous epithelium, these characters cannot be differentiated in the blood on fabrics, especially where urinary stains are present in addition. Should spermatozoa be found, however, considerable value would be attached to the observation.

It may happen, in certain important cases, that it is desirable to preserve specimens of the corpuscles for further examination or reference. The following is, probably, one of the most satisfactory methods of preservation: To some of the solution containing well-marked corpuscles add a drop of a saturated solution of picric acid, which allow to stand and mix for about five minutes; withdraw the excess of picric acid with a slip of blotting-paper; then add a drop of solution of picro-carminate of ammonia and a drop of glycerine or Farrant's solution, and leave uncovered for about an hour; remove the excess of colouring-matter with blotting-paper; then add another drop of glycerine or Farrant's solution, and mount in the ordinary way. Blood corpuscles so prepared will keep for several months at least.

Blood Crystals.—Some have attempted to track the identity of blood to the animal to which it belongs by the particular shapes which the blood-crystals of different animals assume. It was pointed out by Preyer of Jena many years ago that the crystals of some animals differ in shape from those of man, and upon this fact the attempts named have been based; but most recent researches on the subject only emphasize the difficulties in the way of making this a positive means of identification. Among other observers, Dr. Monckton Copeman has carefully worked through the subject,[1] and from his researches, partly confirmed by our own, the following points may be named:—Crystals of hæmoglobin may be easily obtained from the blood of some animals, such as the guinea-pig, rat, and squirrel, but owing to the solubility of human hæmoglobin, it is much more difficult to obtain it in the crystalline form. Crystals may, however, be obtained in one of the following ways:—

[1] *B. M. J.*, vol. ii. p. 190, 1889.

(*a*) By feeding leeches on human blood. After the lapse of some weeks, crystals are likely to be found in the gastric dilatation of the intestinal canal.

(*b*) By diluting human blood with serous fluid, as from hydrocele, ascites, or pleurisy, which has undergone decomposition.

(*c*) By adding crystals of glycocholate and taurocholate of soda to human blood.

(*d*) By adding a drop of cat's bile to a drop of human blood on a slide, crystals may be found, but they are those of reduced hæmoglobin.

Their shape is that of rectangular plates, and their colour varies from greenish to pale claret. But on examining them spectroscopi-

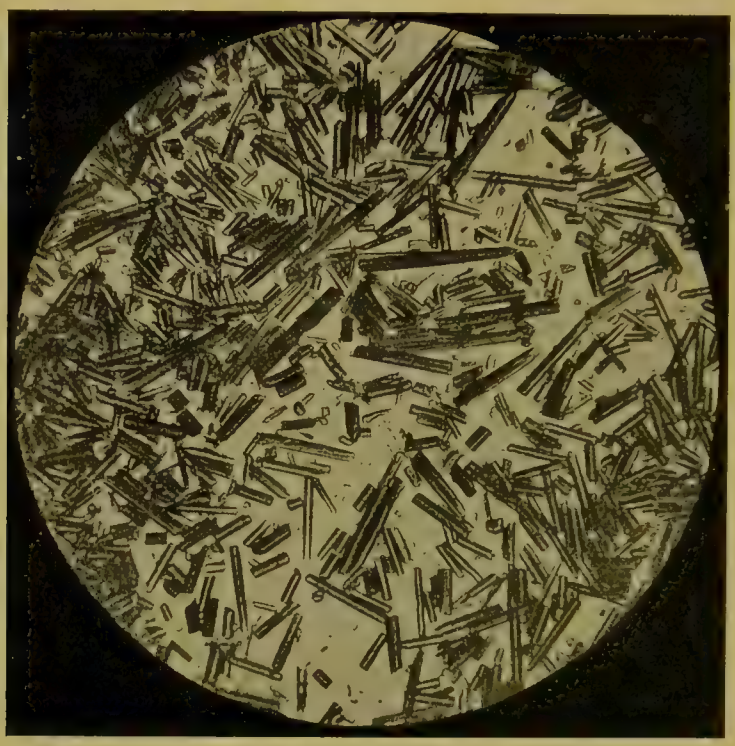


FIG. 78.—Photo-micrograph of Hæmoglobin Crystals. The crystals were obtained by Hoppe-Seyler's Method by Dr. Brodie, University of Glasgow. × 500 diameters. (Author.)

cally, they will be found to give the spectrum of reduced hæmoglobin, whereas the crystals of the lower animals will give that of oxy-hæmoglobin. One important fact has been definitely demonstrated from recent researches in blood-crystallisation, and that is, that the blood of the bullock, sheep, and pig can be made to crystallise only with much difficulty; in medico-legal work these are the stains which most ordinarily must be distinguished from human stains. But even these may be made to crystallise by adopting Gamgee's method of treatment, viz.:—To add to the defibrinated blood about one-sixteenth of its volume of ether, and shake till the mixture becomes transparent or lakey. Allow the mixture to stand in an ordinary tempera-

/^0. (0·9)

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ture for at least 48 hours, when crystals will likely be plentifully found. In this way, blood from the following animals has been made to yield crystals :—

1. Horse.	6. Cat.	11. Mouse.
2. Bullock.	7. Rabbit.	12. Chicken.
3. Sheep.	8. Squirrel.	13. Pigeon.
4. Pig.	9. Guinea-pig.	
5. Dog.	10. Rat.	

Human blood, when similarly treated, does not readily yield crystals, but when such are formed, they uniformly give the spectrum of reduced hæmoglobin, whereas those of the animals above-named give the spectrum of oxy-hæmoglobin. It is probable that this point, when further definite researches have been made, may assume important medico-legal value, but that time has not yet arrived.

HÆMOLYTIC SERUM IN BLOOD-TESTING.

Uhlenhuth has suggested a new method by which different kinds of mammalian blood may be detected. It consists in injecting into the peritoneal cavity of a rabbit defibrinated blood of man, for example, and obtaining from the blood of the rabbit a serum which, when dropped into a clear solution of human blood, causes a cloudiness or precipitate to form, a result which is not produced in a solution of blood from another animal.[1] In medico-legal work, the difficulty is experienced of obtaining the blood solution of such clearness to permit of the application of the test. It would appear, however, that the test may be performed on a filtered blood solution[2] since this observer affirms that it may be applied to filtered solutions of meat, for the detection of the animal from which the meat is obtained. Further investigation, however, is needed on the subject.

This phenomenon has very recently been investigated by a number of observers. The principle, as proposed to be applied in medico-legal work, depends upon the fact that if into the body of an animal A the defibrinated blood of an animal B is injected, after the lapse of a short time the blood of the animal A is found to be hæmolytic or toxic to the blood of the species of the animal B. Deutsch of Buda-Pesth claims priority in the suggestion of applying the principle to medico-legal investigations of blood-stains.[3] Since then the subject has been investigated by Uhlenhuth, Wasserman and Schutze,[4] Nuttall[5] and Tarchetti.[6] In the detection of human blood in a stain hæmolytic serum from a rabbit is used. This is obtained by injecting about 10 c.cm. of defibrinated human blood (according to the method of Uhlenhuth and Wasserman), or a similar amount of the corpuscular sediment of human blood—the serum having been decanted off (according to the method of Deutsch)—under the skin of a rabbit from three to five times in all, an interval of one week being allowed between each injection, then bleeding the rabbit from the carotid artery at the end of this time and preserving the serum of the blood so obtained in an aseptic condition. This serum now exhibits hæmolytic or hæmotoxic effects upon human blood; that is, it produces an agglutinative and destructive effect upon the red corpuscles, and a precipitant effect upon the serum of the blood of Man and the Ape, but no effect whatever upon the blood of other animals. The procedure with reference to a blood-stain suggested by Tarchetti is as follows:—Dissolve the stain to be examined in a few drops of normal saline solution (9 per cent. of salt); filter the solution obtained; put a portion into each of two small test-tubes; to one, (*a*), add about 0·5 c.cm. of the prepared rabbit serum, and to the other, (*b*), unprepared serum from the blood of another

[1] *B. M. J.*, vol. i. 1901, p. 788; *Berl. klin. Wochenschr.*, Feb. 7, 1901.
[2] *Idem*, vol. ii. 1901, p. 1491; *Deut. med. Woch.*, No. 45, p. 780.
[3] *Centralblatt für Bakteriologie*, May 15, 1901.
[4] *Berlin Klin. Wochenschr.*, Feb. 21, 1901.
[5] *B. M. J.*, vol. ii. 1901, p. 669.
[6] *Gazz. degli Osped.*, May 19, 1901, and *B. M. J.*, vol. i. 1901, Sup. p. 104.

rabbit; place both tubes in an incubator at 37° C. At the end of an hour, if the tube (*a*) contains human or anthropoid blood, its contents will have become turbid with a flocculent precipitate, whereas the contents of (*b*) will be limpid and clear. This observer carried out a series of experiments upon the blood-stains of man and other animals on cloth, metal, etc., and he found the method reliable. Such prepared rabbit serum, as described, containing 80 per cent. of diluting saline solution has been shown to have no reactive effect upon the red corpuscles of the blood of a variety of domesticated animals, as the pig, calf, ox, mouse, rat, and others, but to have a markedly hæmolytic action upon those of man. Metalnikoff [1] has shown that this hæmolytic property may be conferred upon the blood of the rabbit by simply feeding the animal with blood; for example, by feeding rabbits on horse's blood, the serum of the rabbits' blood becomes hæmolytic or hæmotoxic to the blood of the horse. It would be unwise at the present experimental stage of inquiry to place too great importance upon the value of this test. Whether it will ever become a test of vital medico-legal importance remains to be proved.[2]

Stains upon Weapons.—One of the most important duties of the medical jurist in connection with suspicious stains, is the detection of the nature of a given stain upon a weapon. With recent stains there is no unusual difficulty, if the procedure already suggested has been followed, but difficulty does emerge when the stain is old, because in ordinary circumstances, what blood there may have been, becomes commingled with rust. In such a case, where the examination by hand-lens shows the presence of rust, it is best (1) to scrape off a portion of the stain into a watch-glass, add a drop of alkalinised water, and treat by Ganttner's method (*q. v.*); (2) to scrape into a second glass, another small portion, acidulate with dilute citric acid, or make alkaline with dilute ammonia; either solution will dissolve out the colouring matter of the blood—if such is present—and will have but little effect on the rust; then filter the solution, and examine one part of the filtrate by the Guaiacum test, and another by the spectroscope. Examine the contents of the filter-paper for iron in the ordinary way. But there are certain stains formed upon bright steel weapons by certain vegetable acids, notably citric and malic acids, which, in some measure, simulate blood-stains which have been mainly washed off. These are due to the formation of the citrate or malate of iron, salts which are soluble in water. All that requires to be done to detect their true character, therefore, is to wash the blade of the knife with as little water as possible, add a drop of strong nitric acid to oxidise the iron into the ferric state, and then a few drops of a freshly-made solution of potassium sulpho-cyanide, when, if the stain be due to iron, the beautiful rose-red colour of the sulpho-cyanide of iron will be formed. This is a very delicate test, and may be rendered all the more striking by adding the reagents only to a like volume of distilled water, thus making a control test of the purity of the reagents. Where very infinitesimal amounts of iron are present, the colour will be less pronounced, and it will be advantageous, in order to detect the shade of colour produced, to look down through the column of fluid in the test-tube alongside that of the parallel blank test against a white background, when the contrast will be distinct.

[1] *Centralblatt für Bakteriolog.*, April 18, 1901.
[2] *Vide* for further reference, McWeeney, *Jour. State Med.*, vol. ix. No. 7, p. 378.

There are certain stains which, upon dark fabrics, may closely resemble those due to blood, such as dirty grease, tar, pitch, snuff, and paints, and which may be carelessly mistaken for blood. There are two methods by which they may be detected: either by the wet method, or the dry method. By the former method, after failure of solution by water-glycerine mixture, and after addition of citric acid or ammonia, different solvents may be employed; for example, ether, or benzene, will dissolve the grease and the paints, and will probably have some solvent action upon the pitch; in that case, the coloured solution should be examined by the spectroscope, when the question will be solved. By the latter method, the simplest plan is to place a piece of clean blotting-paper on a thick porcelain slab, laying upon it the cloth, stain downwards, and then to apply, with some pressure, a hot laundry smoothing-iron to the upper side of the cloth, when the stain will melt and be absorbed in the blotting-paper, if due to grease, tar, or pitch, but will not be affected, if due to paint or snuff. Upon one garment which we had to examine, stains of tar were found, in addition to those of blood, and on another, stains of snuff, due to the snuff-taking habit of the wearer of the garment examined.

Certain aniline colours, too, simulate blood-stains. Those of them which do so may be distinguished by the action of dilute nitric acid upon them, the effect being to convert the red colour into a yellowish shade.

Three questions may be asked of a medical witness regarding which the witness should frankly confess, in the present limits of scientific knowledge, his inability to answer. This is better than to guess, or form an opinion upon inadequate data. They are as follow, viz.:—

(*a*) Is the blood that of a human being?
(*b*) From what part of the body did it flow?
(*c*) What is the age of the stain?

CHAPTER XII.

MEDICO-LEGAL RELATIONS OF THE SEXUAL FUNCTIONS.

THE following are the heads of subjects under which the different relations of the sexual functions may be grouped, and the order in which they will be treated:—

I. Impotence in the Male.
II. Sterility in the Female.
III. Pregnancy, including:—
  (*a*) Criminal Abortion, or Fœticide;
  (*b*) Infanticide, and Concealment of Pregnancy.
IV. Rape, or Defloration.
V. Sodomy and other Unnatural Sexual Crimes.

I. **Impotence in the Male.**—This question may be referred to the medical jurist arising out of cases such as the following: (*a*) where the legitimacy or paternity of a child is disputed on the ground of age, or impotency, of the reputed father; (*b*) divorce; (*c*) rape.

It is but seldom that cases arise under the first head, and where they do arise, it is usually because of the alleged impotency of the male by reason of premature or advanced age, or by reason of bodily infirmities which usually produce the condition, both physiological causes. Below the age of puberty, the male is reckoned to be sexually impotent, although this does not preclude the existence of the power of coitus; hence a male before the age of puberty is, by the law of England, incapable of contracting a legal marriage. In France and Germany the law enacts this age to be eighteen years. Puberty is generally held to be attained at the age of fourteen years, and by the term "puberty" ought to be meant the attainment of virility, not merely that of power of coitus, for this latter power begins, as has been said, earlier than puberty or virility, and continues for some time after—which is a variable period—the virile power has ceased. But although the law fixes the age of the attainment of virility, it places no limit upon the period of age above puberty when a male ceases to be sexually competent. Cases of virile power in elderly men are well known and authenticated. This point was raised in the famous Banbury peerage case, because the putative father was 80 years of age at the date of the birth of the claimant, but the judge there ruled that there was no legal limit to age when the procreative power ceased.

The facts of this case, briefly put, were these: In 1632, Lord Banbury died, aged 85. In 1627, Lady Banbury had a son, and in 1630, another. Both husband and wife lived at the house of Lord Vaux, with whom the wife was adulterous. An inquisition was held after the death of Lord Banbury, in which it was declared that he died without heirs male of his body. In 1646, the son

Case of Sir C. Tennant of the Glen - had 3 children when between 70-80 years

Cases of Relative Impotency.

M + G. The Scots Law Times Reports Vol. 10, Oct. 18, 1902. p. 22 [illegible]

A. B + C. D. Ibidem. p. [illegible]

claimed the title, and from time to time, his descendants, but the House of Lords either denied the claim, or ignored it. However, in 1806, the lineal descendant of the son got it adjudicated upon by the Peers, the famous Lord Erskine being his advocate, and it was proved in evidence that at the time Lord Banbury died, he was a hale and hearty man. Nevertheless, the House of Lords decided in 1813 that the claim had not been established. Lord Erskine in his statement advocating the claimant's case, quoted the case of Sir Stephen Fox, who married at the age of 77, had four children born to him, the last when he was 81 years of age.

That the procreative power in old men is possible, is shown by the fact that Casper records a case in which spermatozoa were found in a man 96 years of age,[1] and that he himself had found them in a person of 69.[2]

Certain bodily infirmities as hemiplegia, paraplegia, and locomotor ataxia, are generally considered as causing impotency, but this must be taken with caution with reference to cases of the first and last-named affections, for hemiplegics and ataxies have been known to be able to procreate, while it may be taken as conclusive, in the bulk of cases of the second. But even of paraplegics, Curling[3] quotes from Brachet's *Recherches Experimentales sur le Systême Nerveux*, 2nd edit. p. 280, a case in which a male, paraplegic for some years, retained such sexual power as to have prolific intercourse. This person after a fall from his horse became paraplegic, and for eight years the paralysis remained stationary. Whilst in this state his wife bore him two children. While there can be no doubt that as the degenerative changes in the cord in locomotor ataxia advance the procreative power becomes weakened and, latterly, is destroyed, there are well-authenticated cases in which, in the earlier stages at least, the procreative power remains. In Bagot *v.* Bagot which was tried in the Irish Probate Court in 1878, this very question of impotency from locomotor ataxia was raised. The tendency to impotency is also produced by certain vicious habits, such as excessive indulgence in alcohol, opium, and tobacco, as also by the prolonged use of such drugs as iodine and the iodides, and bromides. From the medico-legal point of view mental causes do not rank as causes of impotency for reasons which will be pointed out later.

The physical causes of impotency are, probably, the most important from our point of view; they certainly offer the safest bases upon which to found an opinion. Those which cause absolute impotence are the following:—

(*a*) *Absence of the penis.*—Obviously the absence of the organ of intromission is proof of impotency. The late Professor Ogston[4] gives the facts of a case in which a man, on a hunting expedition in Greenland, fell on his knife, causing a large penetrating wound of the abdomen and the total severance of the penis; and he states that this man confessed to him, that though he had sexual desires, he was unable to fulfil the act.

(*b*) *Absence of the testes.*—There can equally be no doubt that the congenital absence, or misplacement, or artificial removal, of both testes produces absolute impotency. In certain cases where the testes have

[1] *Forensic Med., Syd. Soc. Ed.*, vol. iii. p. 291.
[2] *Op. cit.* idem, p. 258.
[3] "Diseases of the Testes," 4th edit. p. 443.
[4] *Op. cit.* p. 77.

either not descended initially, or in which having been replaced in the abdomen by accident during the early part of male life while the spermatic canal is still patent, they have become fixed internally by inflammatory lesions—cases of crypsorchidism or cryptorchidism, as they are termed—the testes may be present, although not found in the scrotum. But in all such cases, their absence causes sooner or later the development of physical changes, or want of development, in the male body. Generally speaking, where this is congenital, the changes which occur at puberty in the ordinarily-equipped male do not take place; therefore, the body partakes more of a feminine build, the voice is like that of a woman by reason of the absence of development of the thyroid cartilage, and the development of the hair upon the face is either entirely arrested, or is but little in evidence. Cryptorchides may, therefore, be reckoned as sexually impotent. Artificial removal of the testes accounts for the official eunuch, the keeper of the seraglio. But the same is not true of the monorchids. Physically, they are usually as other men, and the procreative function is active. We know of two cases of fruitful monorchides. But in the case of a male who by accident or otherwise after puberty is reached loses both testes, the procreative power and the power of coitus do not cease at once, although both are gradually lost, and the procreative power before the other. Sir Astley Cooper[1] relates the case of a man whom he had castrated, who, for twelve months after, had regular emissions of semen, and for two years after, but rarely and very imperfectly; and Otto, of a man who had castrated himself, but whose *vesiculæ seminales*, at his death nine months later, were found filled with semen.

(c) *Malformations of the external genital organs.*—In such conditions as hermaphroditism, hypospadias, epispadias, fistula in perineo, advanced disease of penis or testes, impotency is the rule. Another interesting cause is that of double penis. Dr. Ballantyne of Edinburgh, whose researches in teratology are so well known, contributes an interesting article on this subject and its literature.[2] But there may be impotency from causes which are not apparent externally. Dr. Rushton Parker has recorded a very unusual case.[3] This man had married a wife, but all attempts at coition on his part were futile. Six months after the wedding, the marriage had not been consummated. Both himself and his wife observed that he had periodic monthly discharges of blood *per urethram*, which, on each occasion, usually lasted for three days, and they noted their occurrence monthly from April to November inclusive. On physical examination, there was nothing unusual found in his general appearance, and his external genital apparatus seemed normal, although the testes felt decidedly small and soft. He stated that he had never experienced any sexual feeling, and had never practised self-abuse. Dr. Parker was of opinion that although rudimentary testes had descended into the scrotum the man likely had a uterus and Fallopian tubes.

Another remarkable case is recorded by Ströbe in Zeigler's *Beiträge zur Pathologischen Anatomie*, vol. xxii. p. 1898 (with plates).[4] This person, supposed to be a male, and who had married a wife but had begotten no children, died at the age of 63 of a cancerous stricture of the gullet. He looked like a man, but had scanty hair upon his face. The penis was normal, as was also the urinary meatus, but the scrotum was empty. On dissection of the abdomen, a well-formed uterus was discovered, its fundus being 2¼ inches broad, the Fallopian tubes and the round and broad ligaments being also present. The left Fallopian tube was like the right furnished with a testis and epididymis at its other extremity, as proved by microscopic examination. The cavity of the uterus was found to open into the *caput gallinaginis* of a normal prostate gland. No history of his sexual life was obtainable.

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[1] *Med. Chir. Review*, vol. xviii. p. 390.
[2] *B. M. J.*, vol. i. 1896, p. 1392.
[3] Ibid. 1899, p. 272.
[4] See also Ibid. vol. ii. 1898, Sup., p. 78.

Another case is related by Berthold[1] of a person, aged 22, dressed as a woman —she, however, had to shave on account of the growth of hair on the face —who came to consult him on account of hoarseness and sore throat. On examining the vocal cords, he observed that they were developed as in a male. He concluded that the hoarseness was nothing more than a normal man's voice. On examination of the external genitals, he found that they were concealed by a large left inguinal hernia, which, however, on being reduced, revealed extreme hypospadias, and a bifurcated scrotum, not unlike the female *labia majora*. Berthold, thereupon, pronounced the sex to be male. Having had opportunities later, from time to time, of watching the progress of this person, he found that the timid, coy, person who first consulted him had merged into one bold and brave, and had actually engaged himself to marry a young woman. Although sexual desire was now present, and the semen contained spermatozoa, coitus was impossible.

Like cases are recorded by Chiarleino[2] and others, but the foregoing will suffice to indicate the strange anomalies which give rise to incompetency in the male.

II. **Sterility or Impotency in the Female.**—In the consideration of this aspect of the subject from the medico-legal point of view, it is essential, at the very outset, that the difference between the legal and medical views or interpretations of sterility and impotency in the female should be understood, especially with relation to the matrimonial state. The legal definition may be considered to be: such physical and irremediable conformation of the sexual organs as prevents the act of coition; the medical, as the inability of a woman to become pregnant while in the married state, from any cause whatever, or as Taylor[3] puts it, "the inability to procreate, or a want of aptitude in the female for impregnation." The law of England lays down that no woman under the canonical age of twelve can legally marry, owing, doubtless, to the average time of attainment of puberty, the law of France, 15 years, and that of Germany, 14 years. The first factor, therefore, from the medical point of view, in sterility, is—

Age. Generally speaking, females who have not yet menstruated, and those who have ceased to menstruate at the other extreme of age, are sterile or impotent; from the legal point of view, those females who have not reached the canonical age. But this disability only attaches to legal matrimony; it does not predicate legal impotency, as shall be shown in the discussion of the subject of pregnancy. However interesting may be the questions of precocious menstruation, of the average period of the onset of puberty in females under different climatic environments, and other kindred topics, they have but little direct medico-legal bearing, and, therefore, must be passed over. The only question upon which menstruation may have a bearing in civil cases is that which may arise in the case of women who have ceased to menstruate at or about the usual age when this function normally fails, with respect to the possibility of their further bearing children, in relation to the provisions of a will. But the age at which the average woman ceases to menstruate can have only indirect bearing upon the determina-

[1] *Archiv für Laryngologie und Rhinologie*, vol. ix. part i., February 1899.
[2] *La Gynécologie*, February 15, 1900.
[3] *Op. cit.* vol. ii. p. 303.

tion of the answer in the case of any given woman, since the problem must be satisfied with specific relation to the given case.

We are shut up, then, to the sole consideration of the above subject from the legal point of view, viz.: those causes of physical and irremediable conformation of the sexual organs which preclude the act of coitus. The causes may, therefore, be divided into those which are:—

1. Absolute and Irremediable;
2. Temporary and Remediable; but the possibility of remedy may only be discovered after an action of divorce has been laid.

I. *Absolute Causes.*—These include,

(*a*) Complete absence of the Vulva;

(*b*) Absence of the Vagina.

Where both of these conditions are congenital, the impotency must be looked upon as absolute. The former condition, however, usually resolves itself into some form of hermaphroditism of which the varieties are very great, but in all of which the common feature is the absence of a vaginal canal of such a kind as to enable normal coitus to take place. The dividing line between the sexes in certain cases of hermaphroditism is so narrow that it is extremely difficult to decide whether the individual be a female or a male, either from the point of view of anatomical relation of parts, general physical conformation, or physiological desires. But the vulva may be normal, and yet there may be congenital absence of the vagina. Latouche[1] narrates the case of a woman of 19 years of age, who was well-formed in other particulars, but in whom there had never been any ovarian or menstrual flux, owing to the absence of ovaries and uterus; and Miller,[2] of a girl, aged 16, who was robust and well-developed, in whom the vulva was well developed, but in whom the vagina was absent. On abdominal section, an anomalous mass was found in the normal site of the uterus which weighed six ounces and was of uterine shape, the bulk of which was as hard as bone, indeed presented all the histological appearances of bone. Dr. Cotterill[3] gives particulars of a case of complete atresia of the vagina in a young married lady of 28, in whom the physical appearances were feminine, the mammæ being above the average in size, and the external genitals in the main normal, but in whose case coitus obviously had never taken place. She was operated upon, and some time afterwards she informed Dr. Cotterill that marital relations were satisfactory. Other cases, also operated upon, have been recorded of this kind by Ballantyne,[4] in whose paper a case operated upon by Walton[5] is mentioned. Gooding gives the details of a case of the absence of the vagina in a married woman in whom the urethra discharged the function of the vagina. She had been married for two years, and in the early months of her marriage suffered intensely during coitus. On examination, the urethra was found widely dilated. From the age of sixteen, after an attack of inability to pass urine, which was drawn off by catheter, she felt something suddenly snap, and a dark treacley fluid came away for some days; thereafter, she menstruated regularly. She was operated upon, and a satisfactory connection with the uterus, which was normal, was established.[6]

II. *Temporary or Remediable Causes.*

(*a*) Excessive constriction of the vagina. In view of what has been said of complete *atresia vaginæ*, it is easy to conceive of this condition whether as an imperfect development of the parts, or as a stage of atresia. Such a case is recorded[7] in which the vagina was small in lumen but ad-

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[1] *Arch. Provinc. de Chirurgie*, Ap. 1897.
[2] *New York Med. Jour.*, March 3, 1900.
[3] *B. M. J.*, vol. i. 1900, p. 837.
[4] *Scot. Med. and Surg. Jour.*, June 1899.
[5] *Belgique Méd., Ann.* 5 (1898), p. 354.
[6] *The Lancet*, vol. i. 1879, p. 430.
[7] *B. M. J.*, vol. i. 1900, p. 762.

mitted a sound for a length of 2½ inches, at the upper extremity of which no internal generative organs could, however, be detected by examination.

(*b*) Excessive hyperæsthesia of external genitals. Most authors deem this condition apocryphal, and we were of like opinion, until we saw a case in which the woman, about 40 years of age, although married for 18 months, had never been able to consummate the marriage because of this. Attempts at vaginal examination threw the woman into a state of convulsive excitement. She was put under chloroform, and the parts were stretched manually upon three occasions, and, thereafter, by the use of cocaine ointment, ordinary marital relations were established.

(*c*) Imperforate hymen. These cases are by no means so infrequent as is commonly believed. We have operated on two cases, at periods of 1½ and 2 years respectively after the menstrual function had commenced. Attention to the condition in each case had been drawn by the gradual increase in size of what was thought to be a tumour, but which was due to the retention of the treacley menses.[1]

(*d*) Tumours of vagina; prolapse of the uterus, or of bladder; or malignant growths of vulva.

Divorce.—From the medico-legal point of view, an action of divorce will only lie against a husband, if he, by reason of impotency arising from imperfect conformation of congenital origin, or from malformation of the external genitals of an irremediable kind, is prevented absolutely from consummating the marriage; and against a wife, if she be of such congenital conformation as prevents her from permitting the consummation. These definitions are incomplete, inasmuch as they do not include all the facts, but they form a basis from which to begin consideration of the question.

Marriage is legally a contract between two persons of opposite sex, which presupposes on the part of each the lawful use of the body, or in other words, capability of the fulfilment of the act of physical union by coitus, and any cause whatever originating on the part of either of them which creates a barrier to coitus would, according to civil law, enable declarator of nullity of marriage. From the legal point of view, the impediment may simply consist in the deliberate and persistent refusal on the part of either of the parties to consummate the marriage, although both parties may be normally built. But from the medico-legal point of view, the point to be considered primarily is, Does there exist such physical deformity or deficiency in the body of the party against whom the action of divorce is laid, as to prevent and as is likely to continue to prevent the consummation? According to English law, if a man and woman be joined in lawful wedlock, if some time afterwards the woman shall declare that the husband has not been able to effect coitus, and if she be able to prove her statement by her own condition, the marriage shall be null, because marriage was not only instituted to prevent fornication, but for fruitful procreation. Where a lawful marriage has taken place between a man and woman either of whom is entirely inept, not on account of age, but by reason of some natural impediment to the propagation of children, as for example impotency or like causes, the law shall make the marriage null. Such natural impediments shall equally apply to the woman as to the man.

The General Common Law of Germany practically conforms to

[1] *Glasg. Med. Jour.*, vol. xiv. p. 382.

that of England, and is to the effect that "any married person who at or after cohabitation by their conduct shall intentionally obstruct the attainment of the legitimate object thereof, gives thereby to the other party a lawful occasion of divorce. Any incurable cause of complete inability to discharge the matrimonial duty, even though it have first originated after marriage, also gives occasion for divorce. The like is the case with any incurable bodily infirmity, which excites loathing and disgust, or wholly prevents the attainment of the object of marriage." But this law differs from that of England in that it permits a suit of divorce to lie in the case where an incurable cause of complete inability to discharge the matrimonial duty originates after marriage. Blackstone[1] puts the matter very clearly thus: "A total divorce is given whenever it is proved that corporeal imbecility existed before the marriage. In this case, the connection is declared to have been null and void *ab initio.* Imbecility may, however, arise after marriage; but it will not vacate it, because there was no fraud in the original contract, and one of the ends of marriage, the procreation of children, may have been answered." Based upon this principle, therefore, in cases in which cohabitation has existed for variable periods after marriage, and in which suits of divorce have been raised by one of the parties, decisions of the judges have been against granting the divorce. Many judgments of this kind may be found in Phillimore's "Ecclesiastical Reports."[2]

By the law of England, marriage is both a religious and civil contract; by the law of Scotland solely a civil contract, *consensus non concubitus facit matrimonium* being a maxim of Scottish law. Divorce is of two forms: (1) *a vinculo matrimonii*, which can only be granted where one of the canonical causes of impediment exist, and for medico-legal purposes may be deemed to be particular corporeal infirmities; or, (2) *a mensa et thoro*, with which, medico-legally, medical men have little to do, except in those cases in which the alleged cruelty consists in imparting to the wife or husband, as the case may be, a specific disease as syphilis, as in Campbell *v.* Campbell,[3] and in other cases.

When an allegation is made by the wife against the husband that impotency giving rise to impediment exists, it is the duty of the Court to call in medical evidence. Two or more medical men are appointed to examine the husband in some private place, where the defendant must submit to such an examination as the medical men think necessary, in order to verify the existence of the alleged impediment which causes the impotency. In order, however, to establish the averments of the wife, it is necessary she should show evidence, by a medical examination of her own body, that she is not only *virgo intacta*, but also *apta viro.* The medical evidence will, therefore, include the result of the examination of both parties.

In the case where the husband sues for a bill of divorce against the wife on the same grounds of impediment to consummation of marriage, if she defend the action, medical evidence must be given to

[1] "Commentaries," vol. i. p. 440 (Notes by Christian).
[2] Vol. iii. p. 425; idem, p. 147.
[3] The Campbell Divorce Case, 1886.

show whether or not the allegation is true by the present condition of the woman.

The likely difference in character of the medical evidence in these cases will be that, in the former case, the evidence is *negative*, and in the latter, positive. Since in the former the examination can only apply to the physical conformation of the genitals of the husband, and since any opinion as to his virility must depend upon his being like, or unlike, to other men, and upon the existence of virginity in the wife, which is evidence tantamount to the non-accomplishment of a given and required act, it is clear that the evidence must be of this negative character, for unless there be in the husband marked deficiency or departure from normal of his external sexual parts, no opinion implying inability may be offered. No examiner can positively state, where the usual complement of parts is present in a man, that the virile and procreative powers do not exist; and all that can be stated is that no good reason exists why both powers should not be present. In the case of the female, however, in the latter case, assuming the husband to be normal, the impediment is likely to be obvious, and will probably consist of such defect of the vaginal section of the external genitals as will establish the inability to permit coition; hence the evidence is positive. But the law requires more than this. It is not enough to say that impotency exists in the case of a male or female by reason of impediment; it must, indeed, be shown that the impeding cause is irremediable. For example, where the impediment consisted only of an unduly thick and tough hymen in the female, it would not be considered as a good ground for divorce, since it may be remedied by surgical operative procedure. But in cases where there is, admittedly, defect of parts in the female, such as absence of the vagina, or imperfection of vagina which may not permit of natural and complete coitus, then a suit of divorce would lie. Questions, however, may arise in respect of this latter condition which can only be solved by medical examination and opinion. All that the plaintiff can demand is reasonable and natural access. Should this be possible, even though the other sexual parts necessary to fruitful procreation be entirely absent, the suit will not prevail; but should this be impossible on the other hand, and no operative procedure which the defendant was willing to undergo would be of any avail, then divorce would follow. Contingent upon the view that marriage is a contract, there are certain points which the law would decide from this point of view only. Should, for example, an admittedly defective man or woman—defective in the divorce sense—marry a normal woman or man, and the healthy contracting party be made aware of the condition of the other prior to marriage, no suit of divorce could be established after the union, because of consenting knowledge on the part of the healthy contracting party. In like manner, the development or production of any condition, preventive of cohabitation, some time after the marriage had been consummated, will afford no legal ground for divorce, since the contracting parties by the act of union in marriage do not bind themselves to maintain for all time the physiological bodily conditions in which they were at the time of the union.

To sum up the conditions which would enable a suit of divorce to lie, we would mention the following, viz.:—

(*a*) The existence of an evident and irremediable bodily defect or infirmity which offers complete impediment to the consummation of the marriage;

(*b*) That the said defect or infirmity existed at the time of marriage, and was not revealed before marriage;

(*c*) That the defect or deformity did not arise or develop after cohabitation in the legal sense.

PREGNANCY IN ITS MEDICO-LEGAL ASPECTS.

The question of pregnancy may come before the medico-legal examiner in many various ways and for diverse reasons. Of some of these, the following may be named:—

(*a*) As a reason why a woman should be excused attendance at a trial as a witness.

(*b*) In a case of slander: in which, of an unmarried woman, a widow, or a wife living apart from her husband, it has been said that she is pregnant.

(*c*) To declare whether or not a woman who has raised an action of damages for breach of promise of marriage and seduction, is pregnant, or whether she has really been delivered of a child.

(*d*) To say whether or not a woman is with child, the possible heir to an estate, her husband having but shortly before died, in order that in the disposition of the estate the law of succession be duly satisfied.

(*e*) In cases of supposed imposture of pregnancy, to say whether or not the woman has been pregnant, and has been recently delivered of a child.

(*f*) To form an opinion whether or not a woman, at or about the age of the menstrual climacteric, is likely to become pregnant either for the first time, or in continuation of a series of pregnancies, with relation to the question of wills or adjudication of estate.

(*g*) To say, of a given woman who has been sentenced to death and who pleads in bar of execution of sentence that she is pregnant of a quick child, whether she is or not.

(*h*) To declare in cases of alleged criminal abortion whether or not the woman has been actually pregnant.

(*i*) In cases of alleged concealment of birth or pregnancy and infanticide, to affirm whether the woman has or has not been pregnant, and, if she has been pregnant, to say whether or not she has been recently delivered of a child.

There are other contingencies besides these, but the foregoing will serve as illustrations.

Generally speaking, the possibility of pregnancy must depend upon the function of ovulation with which menstruation is closely associated; therefore, we must take cognisance of the ages when the function of ovulation commonly begins and ends. Leaving to one side cases of precocious menstruation in infants and young children, which is most usually an index of ill-health, there are abundant records to show that the average ages between which girls in this country attain puberty are 14 to 16 years. But as is well known, climatic conditions affect the period of onset; it is much earlier, for example, in warm climates as India, and later in rigorous countries as Northern Europe. Engelmann[1] has pointed out from statistics collected from his own observations and from those of others,

[1] *B. M. J.*, vol. i. 1900, p. 1374.

that of 5000 girls in the United States—Boston and St. Louis—the average period of onset was between 13½ and 14½ years, and he affirms the general principle that birthplace and parentage less affect the period than do the surroundings and mode of upbringing. But while it is the rule that a woman usually becomes pregnant only after the *known* establishment of menstruation, as exhibited by the usual signs, cases are far from being rare in which impregnation has occurred where the usual signs of menstruation had never appeared. In such cases, we are shut up to one of two conclusions, viz.: either that the process of ovulation must not necessarily be accompanied by such uterine excitement as produces the menstrual flow, or that the stimulus of marriage has awakened the hitherto comparatively inactive process of ovulation. There can be little doubt that both conditions are to be found. For apart from the cases in which a woman marries before the usual external signs of menstruation have appeared and in which condition she becomes pregnant, and where besides, the external signs only appear after her first pregnancy, there are cases within the range of experience of all practitioners, in which a woman may, from the time the menses cease on her first impregnation, pass through two, three, or more rapidly successive impregnations without any external sign whatever that the process of ovulation had been resumed. One writer records a case within his own experience in which he attended a lady in several confinements, who was in fact the mother of twelve children, and who had never menstruated.[1] But there are good grounds for believing that in some women, certainly, the process of ovulation goes on regularly without any external manifestation of menstrual flux, at least of a sanguineous character, and it is not unreasonable to believe that, in such cases, the flux may only be of a mucous character. But the fecundity of married women cannot in any way be based upon the regularity and normal character of the menstrual flux, as too many factors embarrass and disturb the calculation. Instances are numerous of women who have been sterile to one husband and fruitful to a second. While, in the general case, the bodily health of the woman affects the process of ovulation, and, therefore, the likelihood of impregnation, we have to reckon with those women who in wretched health, even in phthisis, conceive readily. Indeed, certain writers on this subject have asserted that the cycle of the reproductive function is an autonomy within the body of the female, and, to some extent, independent of the general bodily condition; and they adduce as reasons for that opinion, the foregoing fact of apt pregnancy, and also the other that some women during their earlier pregnancies have a periodic menstrual flux. Whether this latter fact is solely to be accounted for by a bicornate uterus, it is impossible, however, to assert. Fecundity would appear to be influenced, in certain instances, by heredity. Various writers have drawn attention to this, of whom we shall only quote two: Valenta[2] narrates an extraordinary case of hereditary fertility. The woman who was married at the age of 14 years, during a married life of twenty years gave birth to 32 children in eleven

[1] *B. M. J.*, vol. i. 1897, p. 1071.
[2] *Wien. med. Wochenschrift*, No. 3, 1897.

pregnancies; there were twice quadruplets, six times triplets, and thrice twins, twenty-six were boys, six were girls, of whom twenty-eight were born alive, and four, dead. Her first essay in parturition was at the age of 14, and yielded quadruplets. Her mother was one of quadruplets, and she had borne 38 children. There was, likewise, a history of plurality of births on the father's side. Macphail[1] also gives an account of a case in which he traces the tendency to plurality of births through five generations, but in no single instance in all the generations was the plurality greater than triplets.

As bearing upon the duration of pregnancy, the variability among women of the interval between the menstrual periods must not be lost sight of, as certain writers do not hesitate to assert that it has the most important bearing in cases of abnormal duration, either on the side of brevity or length. To this question, however, we shall return. At the other end of female life, the time when impregnation becomes impossible through cessation of the function of ovulation is equally difficult to determine, for while the average age may be stated to be any age between 40 and 60, any conclusions of a special case based upon such an average would be very fallacious and misleading. In this, as in the period of onset of the function, there are marked individual differences. In medico-legal practice, reasoning from the general case to the special may be permissible in certain circumstances, but in this contingency an opinion should be based upon the individual case only, and even then, with caution. Anomalies in age at which ovulation ceases happen too frequently to be ignored. When it is recollected that in well-established cases the function has ceased so early as the age of 23, and has continued so late as 77,[2] the importance of considering each case upon its individual merits becomes apparent. If it be true, therefore, that the regularity of menstruation is an index of the continuity of the process of ovulation, the period at which a woman may become pregnant becomes a wider one than might, at first sight, be supposed. This subject will be considered, however, in the discussion of legitimacy. As it is possible for a woman to conceive before the external signs of menstruation have appeared, so also must it be reckoned as possible in a woman within a limited time after these manifestations have disappeared.

Within the past year we became acquainted with the following case. A woman, aged 47, who had ceased to menstruate for over a year, began to experience discomfort by reason of abdominal swelling, which was diagnosed by a practitioner as a uterine tumour, which tumour, however, some months later made its appearance in the world as a fine healthy boy.

From these preliminary considerations, we return to deal with the circumstances enumerated at the beginning of this chapter in which an examination regarding pregnancy may have to be made.

Regarding the first-named, viz.: the relation of pregnancy as an excuse for the attendance of a woman as a witness, it ought to be definitely understood that the mere fact of a woman being pregnant is not of itself a sufficient excuse, except that she is so far advanced in that condition that her delivery is imminent. At the same time,

[1] *The Lancet*, vol. ii. 1895, p. 1429. [2] Whitehead, *The Lancet*, 1886.

a valid excuse of non-attendance may be offered, and will probably be accepted, if, owing to any inter-current condition arising out of the pregnant state, she would suffer risk or prejudice to herself or the product of conception by such attendance, such as risk of abortion, hæmorrhage, etc., in which case a legal medical certificate would cover.

The next two named contingencies, *b* and *c*, which depend upon the simple diagnosis of pregnancy, will fall under the discussion of the signs of pregnancy.

Where the succession to an estate depends upon the possible existence and live-birth of a posthumous child, the fact of pregnancy becomes of greater importance, since in that case, and in the event of the husband and father having died intestate, the estate will have to be tied up until the question is solved, in the event of the pregnancy of the widow being established, by the birth of the infant. Besides, a legacy, or an estate, may be left to a child *in utero*, and it may have a guardian or trustee appointed to administer its affairs, contingent on the expectation that it shall survive the perils of birth. Then there is the position known in English law as *in possessio fratris*, which may be illustrated by the following supposititious case: A man, who has been married twice, dies: his second wife, surviving him, is pregnant. From each union there has been one female child. The posthumous child proves to be a male, who only survives his birth a few minutes. By his birth, the disposition of the father's estate becomes entirely changed. Had the posthumous child not existed, the estate would have been divided equally between the two daughters; but his birth has the effect of transferring the whole of the estate to the daughter of the second wife, because she is the nearest relative to the male heir, while the daughter of the first wife becomes only half-blood. Again in English law, the writ of *De ventre inspiciendo* may be issued under the following circumstances: A husband dies without as yet any issue by his wife who survives him, and the succession to his estate falls to his heir-at-law. But the wife declares that she is pregnant. To verify this fact, or to disprove it, becomes a matter of importance to the heir-at-law, who asks the Court to issue the above writ for medical inspection, upon which the answer to the issues depend.

Imposture of pregnancy is but rare, but that it may have been practised in earlier times is postulated by the fact that the births occurring in Royal families must be attended by a Minister of State. One of the most remarkable cases, as indicating what a woman will do to achieve her purpose, fell within our experience a few years ago in police practice. A woman who was in the habit of "farming" children, and to whom the attention of the police had been called, was observed by her female neighbours to have suddenly increased in bulk, and she gave it to be understood that the cause was pregnancy, and that in two and a half or three months later she expected to be confined. The neighbours' suspicion was aroused; her bulk increased, until one morning about the time named it was announced to the neighbourhood that she had been confined. The women were indignant at her attempts to deceive them, and they gave a hint to the policeman that he should get the doctor to examine this woman, who, they said, had never borne the child, but had tried this method of realising her

object. When we went to her house, she was in bed, and lying beside her was an infant. The "binder" was applied, and the lower parts of the underclothing bore evidences of bloody discharge. The infant was trying to extract milk from the nipple of a withered breast in which there was no milk, nor likely to be any. Examination *per vaginam* revealed the fact that she had not been recently delivered and had not been pregnant. In this case, it will be noticed that both imposture of pregnancy and pretended delivery were attempted. Most usually, however, it happens that higher stakes are at issue when these attempts at deception are practised; indeed, to introduce a supposititious child into the world as the heir to a property. Although several cases might be cited, the following which was recorded by Dr. Balfour—the translator of the Sydenham Society Edition of Casper's "Forensic Medicine"—is very typical.[1]

The following is a summary of the facts: about two months before the end of December, 1879, Dr. B. attended a Mr. X. in his last illness, during which he observed the extremely assiduous attention of the wife to her husband. On the 29th December, Dr. B. received a note from Mrs. X. requesting him to call some time during that day. He did so, late in the afternoon, and was not a little astonished to find a nurse in the lady's room seated before the fire with an infant in her hands. He apologised for having been late, as he did not think it could be a case of that kind since he had not been engaged to attend; besides, there was no mention of the nature of the illness in the note, and he did not even know that she was pregnant. Mrs. X., however, received his explanation in a "kindly spirit." Thereupon, he made inquiry respecting the time of the birth, and was surprised to learn that it had taken place, as she told him, at 5 P.M. of the previous day. She also informed him that the child had been born before the arrival of the nurse, and that a neighbour had assisted her during her labour. She was a primipara. Up to this point Dr. B.'s suspicion was not aroused, but gradually as he sat in the room he began to suspect the probability of some deception being practised. To find this out, he sent the nurse into an adjoining room, while he, under the pretence of looking that everything was right, proceeded to make an investigation of the pc..on of the patient. She, being generally of an anæmic condition, could reveal nothing to him from that point of view. He found the binder properly applied, and her chemise well stained with blood; but on making a vaginal examination, he was at once convinced that she had never borne the child, and at once told her so. She, on solemn oath, declared that the child was hers. The nurse was now brought in, and the remains of the child's umbilical cord were examined: the appearance of it and the alleged time of the birth did not tally. The nurse was again sent out of the room. He then repeated the assertion that the child was not hers, and that she was not the mother of it. She, modifying her tone, said, "Do you say it is not mine?" He replied, "Certainly not." Thereupon, she attempted to bind Dr. B. to secrecy, which, however, he refused to listen to, adding that if she did not give a true account of the matter he would call in the aid of the authorities. She then told him that she got the child from an unmarried woman in Leith who had been delivered of it the day before she took to her bed, and that, although she had said that she had been delivered of it at 5 P.M. the night previous, the child did not actually arrive at her house till between 7 and 8 P.M. The cause of her conduct, according to her own statement, was her great maternal affection; the true cause was, probably, the fact that, as her husband had died intestate, she was only entitled to one-third of the property he had left, while the child would have received the other two-thirds, had her deceit proved successful, and she would, also, have been placed in receipt of an allowance as the natural guardian of her child. Her plot had, evidently, been well laid. She had informed a male friend of her husband, and his lawyer, at the time of the death of her husband, that she expected to be confined in about two months after that time, and the property had been tied up

[1] *B. M. J.*, vol. i. 1880, p. 241.

in expectation of the event. She had previously expressed the hope to friends, on several occasions, that her baby would have blue eyes, like those of her late husband. This feigned child did actually possess eyes of that colour, a fact which might have gone far to prove the heirship had she been successful in her fraudulent plans. The nurse was entirely innocent of connivance in the attempt to defraud.

The next condition to be considered is that in which a pregnant woman is sentenced to death, who declares that, being quick with child, the execution of her sentence should be delayed until the child is born. As we have elsewhere pointed out,[1] the judge who has tried the case must appoint under the writ *de ventre inspiciendo* a jury of matrons to examine the woman, and, according to the law of England as it stands at present, such jury is to be composed of married women taken from those who may be present in Court at the time. It need hardly be pointed out that this is an anachronism. Indeed, some judges under such circumstances ignore the law and either appoint a medical man to act along with the jury of matrons, or two medical men without said jury. In 1882, the Parliamentary Bills Committee of the British Medical Association made a representation to the Crown "that the practice of empanelling a jury of matrons in cases in which pregnancy is pleaded in bar of execution is not in accordance with medical science, and that the law on the subject requires alteration." Moreover, in the draft code of the Criminal Code Commission of 1879, the same view is given effect to in section 531, in the following terms: "If sentence of death is passed upon any woman, she may move in arrest of execution on the ground that she is pregnant. If such a motion is made, the Court shall direct one or more registered practitioners to be sworn, to examine the woman in some private place, either together or successively, and to inquire whether she is with child of a quick child or not. If upon the report of any of them it appears to the Court that she is so with child, execution shall be arrested till she is delivered of a child, or until it is no longer possible in the course of nature that she should be so delivered. After the commencement of this Act, no jury *De ventre inspiciendo* shall be empanelled or sworn." It will be observed that in the law as it stands, and as is proposed in the new Criminal Code, the stay of execution will only be successful should the woman prove to be *quick* with child—that is, where the movements of the child in the mother's body can make themselves perceived by an experienced observer, or by the sound of the fœtal heart as heard by the physician. This is based upon the statement of the law of England which "considers life not to commence before the infant is able to stir in its mother's womb,"[2] and, also, according to canon law, "*non est homicida, quæ abortum procurat, antequam anima corporis sit infusa.*" In older statutes, accordingly, it was deemed a graver offence if the attempt to procure abortion were made after the quickening of the child, than before. But although the law has moved forward, and now considers the crime of abortion, *quâ* the act itself, to be equally grave at whatever time produced between

[1] *Edin. Med. Jour.*, July 1895.
[2] Blackstone, "Commentaries," vol. i. p. 129.

conception and the natural onset of labour, it has left certain anomalies behind, of which the foregoing is one. Much might be said against the view which the law takes of the product of conception within the body of a sentenced woman, but it is, perhaps, sufficient to say that there is no difference substantially between the fœtus one week before quickening is perceived and one week after, except the mere accident of time, since physiological life is present all the time; and if the law is to be logical it ought to be, in the conditions under discussion, either that the product of conception at no period of its intra-uterine growth is sacred, or that during the whole period it is sacred and worthy the jealous care of the State, as it is deemed to be in civil law. The law of Scotland takes a more logical view, viz.: that in respect that a woman pleads she is pregnant, and is, therefore, unfit to undergo sentence of death, her plea, if substantiated, entitles her to have sentence delayed until her child is born, irrespective of its stage of intra-uterine growth.[1] In France, also, the pregnancy of a woman, irrespective of the age of the fœtus, compels postponement of execution.

Having, then, dealt with the occasions upon which the question of pregnancy may arise, apart from the crimes of criminal abortion and concealment of birth or pregnancy, which will be considered by themselves, the signs of pregnancy next fall to be considered.

Signs of Pregnancy.

The signs of pregnancy consist of the following:—

1. Cessation of the Menses.
2. Morning Sickness.
3. Mammary Changes; which consist chiefly of gradual enlargement of the mammary glands, and the formation of a pigmented areola round the nipples, and, in the later months in primipara, of the presence of colostrum or milky secretion, which may be expressed from the nipples.
4. Abdominal Changes; which consist, (*a*) in gradual enlargement, developing to hyper-distension; (*b*) pigmentation; (*c*) signs of hyper-distension of skin of abdominal wall; (*d*) the discovery, by palpation, of a more or less solid body by the sense of touch, and, it may be, of fœtal movements.
5. Changes in the Uterus and Vagina. In the former, (*a*) by enlargement in size, as discovered by bi-manual palpation; (*b*) by the velvety feel of the mucous membrane of the os; (*c*) by the soft cushion-like feeling of the uterine neck; and (*d*) by the port-wine colour of the mucous membrane of vulva and surface of vagina, which is called *Jacquemier's test.*
6. Quickening. This is perceived by women themselves at variable periods depending upon their individual experience of the sensation, for it can hardly be expected that a primiparous woman will detect it so soon as a multiparous; and upon the progress of fœtal development, since the development of the fœtus at equal ages varies. It is, probably, for this latter reason that the term of pregnancy at which different women discover quickening differs so much, for although it is usually

[1] Hume, vol. ii. p. 471.

reckoned to be perceivable by the average woman about the 17th week, it may be perceived one or more weeks earlier or later.

7. Fœtal Heart Sounds. These can only be perceived by an experienced observer after the uterine and abdominal walls are sufficiently in juxtaposition that by conduction through fœtal body, uterine and abdominal walls, and stethoscope, the sounds of the heart movements of the fœtus are conveyed to the ear of the observer. When such are heard it is unequivocal evidence of the pregnancy and of the life of the child. They sound to the ear of the listener like the muffled ticks of a watch under a pillow, and the number of beats per minute varies as the uterine age, being from six months onwards from about 160 to 120 per minute. The situation on the abdomen in which they may be perceived depends upon the posture of the fœtus *in utero*. Their absence does not exclude pregnancy, since the child may be dead, nor even negative fœtal life, since if a column of *liquor amnii* interpose between the fœtal body and uterine wall, the conduction of the sound may be so interrupted that no vibrations reach the ear of the listener. There are, in addition, other sounds which are perceivable by the stethoscope from the pregnant uterus, which are due to the fœtal circulation. These are called, collectively, the Uterine or Placental Souffle. It would appear as if they were caused by the waves of blood rushing into the sinuses of the uterus.

8. Ballottement. When a movable solid body of heavier specific gravity than water is surrounded more or less by fluid in a practically closed cavity, it falls by gravity to the lowest part of the cavity; if, then, the finger suddenly tilts, or tips up the solid body by an upward movement, it will momentarily leave the finger, ascend into the fluid, and then fall back into its original position, and in doing so, will impart to the finger the sensation of a falling body, if the finger be retained *in situ* during the experiment. This constitutes the phenomenon known as ballottement. It is most easily and readily perceived between the fifth and seventh or eighth months, owing to the ratio between amount of *liquor amnii* and size of fœtal body which obtains during this interval, and which, earlier or later than the months named, is different; that is, the liquid is of greater bulk than the fœtal body.

But of the foregoing signs, some are certain and some uncertain. Of the certainty of the signs in the earlier months it is difficult to speak, since an opinion at this stage must depend more upon the combination of signs than upon the distinctive character of any individual sign. Thus cessation of the menses and morning sickness, of themselves, are very uncertain signs, since the menses may disappear temporarily from causes other than pregnancy, and a flux of blood may periodically recur even after conception for a variable number of months, if not, indeed, throughout the whole duration of pregnancy; in like manner, the latter symptom may not be present at all, or at such comparatively rare intervals only, that no stress can be laid upon

it as indicative of pregnancy. But, on the other hand, should cessation of the menses, morning sickness, gradual pigmentation of nipples, and enlargement of mammary glands, exist together along with a visibly increasing abdominal bulk and a port-wine coloration of the mucous membrane of vagina, it may reasonably be concluded that pregnancy exists. In the later months—the latter half of the period—there are signs, however, which are absolutely certain: if the fœtus be alive, the fœtal heart-sounds, fœtal movements, and ballottement, will indicate the fact with certainty; if the child be dead, however, palpation of the contour of the fœtal body, when such is possible, with ballottement, but with none of the specified signs of life will point to the presence of a dead fœtus *in utero.*

Certain diseased conditions of the abdominal cavity and of the internal generative organs themselves may simulate very closely the normal pregnant state. Of these, probably the chief are: (*a*) ascites; (*b*) fibroid tumours; (*c*) ovarian cysts; (*d*) extra-uterine pregnancy; (*e*) retention of the menses from imperforate hymen; (*f*) phantom tumours. It is not, however, necessary to discuss the differential diagnosis of these in any detail, because the student will likely have had opportunities of seeing some, if not most, of these diseased states during his clinical studies. The greatest difficulty in differential diagnosis will be experienced with the three first-named, as examination *per vaginam* would at once reveal the imperforate hymen and the normal condition of the uterus in the case of phantom tumour, verification of which latter diagnosis can be made by putting the patient under chloroform. While ovarian cysts most frequently develop toward the later period of menstrual life, they are of sufficiently frequent occurrence during the active menstrual period to compel attention. The history of the development, the absence of other signs of pregnancy, which are sure to develop if the case is one of pregnancy, and the initial unilateral development of the abdominal enlargement with clearness of percussion at the flanks, would probably tend to clear up the diagnosis. Fibroid tumours of the uterus of such a size as to be mistaken for pregnancy are likely to have a history of slow development and of very gradual abdominal enlargement, and local uterine examination, in addition to bi-manual manipulation, are likely to reveal such facts as solidity of tumour, absence of the evidence afforded by ballottement, and absence of change in mucous membrane of os and cervix uteri, as will establish a diagnosis. In like manner, ascites may be distinguished from pregnancy by the uniform development of the abdominal swelling, by the wave-like motion of the fluid on percussion either in the sitting or recumbent posture when any measure of distension has been reached, and by the dulness in the flanks in the lying position. The greatest difficulty is likely to be experienced in the differential diagnosis of extra-uterine pregnancy from normal pregnancy, since in both the same early signs are likely to be present, viz.: sympathetic changes in the mammæ, as shown by the pigmentation and gradual enlargement and fulness of the mammary glands, and gradual development of abdominal enlargement. In the former, however, menstruation is more likely to be continued, and the local uterine changes do not develop in the former as in the latter. The student should consult treatises of midwifery

for fuller information on this subject. The question has been canvassed from time to time whether or not in a virgin female such substances as simulate very closely products of conception may not be expelled from the uterus. It has been asserted by Jacob and others that a hydatidiform mole, for example, may develop independently of impregnation. Whether this is correct or not, it would be impossible to affirm with certainty, because there are too few cases upon record on which to base judgment of a definite kind. At the same time, cases of a striking kind appear from time to time.

Bock[1] gives particulars of the case of a girl, aged 12½ years, living under conditions which rendered the question of virginity beyond doubt, who menstruated for the first time at the age of 12 years and two months, and during which period clots were painlessly passed. At the following period there was, however, pain, and a clot was passed, which consisted of a complete cast of the endometrium, with uterine glands and ciliated epithelium. The same thing was repeated at the next illness. At the fourth period there was slight flux for three days, and then a typical hydatid mole was expelled, which was made up of vesicles like rows of beads, each of which was full of a serous fluid and varied in size from the head of a pin to a pea. After this, her periods were normal up till four years after, when the facts of her case were published. The only apparent difference between the foregoing case and hydatidiform degeneration of the villi of the chorion (the product of a blighted ovum), is that of size, for the physical appearances of the hydatids seem very identical. Assuming that the question of virginity is beyond cavil, then it is obvious that another source of hydatidiform degeneration than that of the villi of the chorin must be reckoned with. Bock is inclined to connect the membranous dysmenorrhœa and hydatidiform mole closely together, and to view the origin of the latter as a pseudo-placental change of a part of the retained menstrual decidua. While this raises a very important and novel point in uterine pathology, it likewise opens up grave medico-legal issues, which, however, must be left unconsidered at present.

The Signs of Pregnancy in the Dead Body.—From the external appearances of the body alone, the chief signs will be those which are present at the stage of the pregnancy at which the woman died, and are likely to consist of (*a*) mammary changes; (*b*) abdominal enlargement; (*c*) changes in os and cervix uteri. But if the body may be dissected, no special importance need be attached to these, since by simply opening the uterus the fact may at once be discovered. In the older books on this subject, great importance was attached to the presence or absence of a true *corpus luteum* as indicating whether pregnancy had been present or not. It appears to us, however, that too much importance was attached to this, in view of the fact that dissection of the uterus would reveal far more truly than any other kind of examination whether or not uterine products of conception were present, or had been present. Whatever importance this may once have had, is, however, completely destroyed by the discovery that true *corpora lutea* have been found in the bodies of women who were neither pregnant nor even menstruating. In a paper by Popoff of Pensa, read before the Obstetrical Society of London in May, 1882,[2] the following facts were recorded: A prostitute, aged 21, died from poisoning by prussic acid. In one of her ovaries a fully ripe *corpus luteum* was found, although she was neither pregnant nor menstruating. A woman, aged 41, died from gangrene of a uterine fibro-myoma: her

[1] *Bull. de la Soc. Belge de Gyn. et d'Obst.* vol. x. No. 3, 1899.
[2] *B. M. J.*, vol. i. 1882, p. 778.

ovary contained a true *corpus luteum*, and, in other respects, resembled the ovary of a pregnant woman, which the narrator accounted for by the increased determination of blood to the part, owing to the presence of the tumour. The late Dr. Matthews Duncan, in commenting on this paper, stated that he had seen such a *corpus luteum* in an aged woman, and that he had dissected a case of pregnancy in which there was complete absence of a *corpus luteum*. Where, therefore, the body is at disposal for dissection, reliance must be confined to the internal appearances of the uterus in the determination of pregnancy.

Pregnancy with Reference to Female Age.—The only points of medico-legal interest arising in this connection are: (1) What is the earliest age at which a girl may conceive? (2) What is the latest age at which women have been delivered of children?

Precocious pregnancy exists comparatively rarely, but several cases have been recorded from time to time. Leaving on one side those cases where in warm climates, by reason of early menstruation appearing normally in girls, earlier pregnancies are apt to occur, and confining our attention to cases within the temperate zone, some are recorded where conception has occurred so early as *eleven years and ten months*. This particular case is recorded by Taylor[1] as having been discovered in the trial of a charge against a man (R. *v.* Chattaway, Coventry Summer Assizes, 1838) of misdemeanour, in that he had carnal knowledge of a girl between the ages of ten and twelve years, from which the girl became pregnant and was delivered of a child at the age of twelve years and seven months. We have notes of a case which was attended by a student while acting as an assistant, in which a girl aged *twelve years and two months*, was delivered by him of a child at full time with the aid of forceps. She must have conceived, therefore, at the age of *eleven years and five months*. Another case is recorded[2] by the late Dr. J. G. Wilson of Glasgow, in which a girl was delivered of a child at the age of 13½ years. Probably one of the earliest cases on record is that reported by Roberton of Manchester,[3] in which a girl, a factory-worker, conceived in her eleventh year, and was delivered of a full-grown child a few months after ~~the completion of~~ her twelfth year.

Greater importance, probably, is associated with the second query since arising out of the age of certain women at the time of their delivery late in life, important legal issues, as in the Douglas Peerage Case, have emerged. Many cases have been recorded of the delivery of women at ages usually considered to be long after the fecund age. While it is generally true that the fecundity of women ceases the nearer the age of the climacteric period is approached, and that impregnation does not usually happen after 45 years of age, it is rather with the exceptions that medico-legal science has to deal. Women have conceived and borne children when they were past 50; therefore, it would be foolish to try to fix the age in women at which pregnancy may not happen below 55. It is, however, in this series of cases that legal issues arise. In the Douglas Peerage case, which arose out of the legitimacy of the claimant being contested, tried at Edinburgh

[1] *Op. cit.* vol. ii. p. 307. [2] *Edin. Med. Journ.*, vol. vii. p. 332.
[3] "Midwifery," p. 30.

/ she attained

in July 1767, before the Lords of Council and Session, fifteen judges sitting, the question of legitimacy or illegitimacy centred round the question whether Lady Jane Douglas at the age of 49 could have conceived and brought forth a son. Each judge gave a judgment, and on the vote being taken, seven judges voted in favour of the legitimacy of Archibald Douglas and seven against, whereupon the Lord President gave his casting-vote against the claimant, and thus the Court declared against his legitimacy. The case was, however, appealed to the House of Lords, and there the judgment of the Court of Session was reversed in 1769.

The only cases of this kind which have fallen within our personal experience are the following:—

1. Mrs. D. was delivered on 16th Jan., 1882, of a very large female child, in the 51st year of her age. This was her thirteenth child, and a lapse of many years had occurred since her previous confinement.
2. Mrs. W. was delivered of her first child, a large male, when she was of the age of 44, on 23rd April, 1881, and of her second and last, also a male, on 22nd July, 1882, when in her 46th year.

Duration of Pregnancy: or Period of Gestation.—Popularly, the period of gestation is reckoned as nine calendar months; scientifically, it is said to be an average period of 10 lunar months, 40 weeks, or 280 days; and legally, of 40 weeks or 280 days; but counsel is permitted to lead evidence in any given case as to the possible extension of that period. While the scientific or medical estimation of the period of gestation may be shortly stated as 280 days or thereby on the average, it would probably be still more correct to say that as labour comes on at the date when the tenth menstrual flow would, if it had continued, have begun, the duration of pregnancy must be reckoned from the date of conception as including ten menstrual cycles of any individual woman. So that while it is correct to say that in the large bulk of cases the period is that of 280 days, because of the menstrual cycle of the bulk of women being 28 days, it must be considered as possible that the period of gestation may be longer where the individual menstrual cycle is longer, or may be shorter where it is shorter. Thus a woman whose cycle was 28 days might be expected to be delivered at the onset of the tenth cycle, viz. $28 \times 10 = 280$ days; where the cycle was 29, 290 days, and in a rapidly diminishing ratio of cases, where it was 30 days, 300. So, also, on the other side of the average, the duration of the cycle might be 27, therefore, the duration of pregnancy would be 270 days, or 26 days and 260 respectively. By the formulation of the foregoing principle, which appears to be probable, we are bound, within physiological limits, by its logical issues. This doctrine, therefore, which was first laid down by Cederschjöld, Schuster,[1] and others,[2] may be considered as the opinion of the advanced gynæcologists of our time. Schuster, indeed, has shown of four cases how the duration of pregnancy must be reckoned on the length of the menstrual cycle; in one, where it was 29 or 30 days, the first pregnancy lasted 296 days, the second, 300 days. These are but illustrative of many other recorded cases. Taussig[3] has made a valuable

[1] Henke's *Zeitschrift*, Bd. 57, s. 1.
[2] Spiegelberg, "Text-Book of Midwifery," vol. i. p. 65 (Syd. Soc. Ed.).
[3] *Amer. Jour. of Obstet.*, Sept. 1901.

contribution to this subject. He gives a narrative of the facts of a case in one of his patients. Her menses ceased on Dec. 7, 1897, and a male child was born on Oct. 26, 1898, which weighed over 11 lbs., and measured nearly 22 inches in length. According to his calculation, her pregnancy lasted 323 days. In her next pregnancy the duration was 285 days. He further gives a report of 61 cases in which the period of gestation varied between 300 and 348 days, which have been recorded by other observers. The reader who desires to pursue the subject further is referred to his contribution for further details. It is now well established that pregnancy may be prolonged till the 300th day. Casper's propositions[1] on this subject are so apt that we quote them in full:—

(*a*) The usual duration of pregnancy is from 275 to 280 days.

(*b*) Pregnancy may, however, indubitably be protracted beyond this, and that even as far as the three hundredth day.

(*c*) Cases in which pregnancy is alleged to have been protracted considerably beyond this, even to the eleventh, twelfth, and thirteenth months, have never been determined by accurate observations, and allegations of this kind in any individual case are, therefore, completely inadmissible.

The great difficulty in establishing the actual period of gestation is probably due, in large measure, to the absence of accurately observed data over a sufficiently large series of cases. Even in those cases which, so far as the physician is concerned, have been carefully observed, the possible error of the personal reckoning of the woman herself cannot be computed. Therefore any scientific data can only be founded upon rare isolated cases, in which, by reason of a single coitus with a resulting pregnancy, the duration of pregnancy may be reckoned. But even in that case, coitus is not necessarily contemporaneous with conception; indeed, a number of days may elapse between the two occurrences sufficient to completely invalidate the conclusion. So far as we can see, therefore, the foregoing propositions state the case with considerable accuracy. The following may be considered as typical of recorded cases of protracted gestation:—

1. Rea[2] attended a woman in her fourth confinement whose last menstrual illness was September 4, 1896, but she did not have sexual intercourse till September 30, two days before her next expected illness. There had been no intercourse during the previous two months, and there was none after the above date till her confinement. She, therefore, expected to be delivered on July 6, 1897, but although she had on two occasions severe hæmorrhage, labour did not come on till August 5, the fœtus being anencephalic. If the patient's statement is correct, then her pregnancy lasted 305 days.

2. Wigodsky[3] records a case of protracted gestation which lasted eleven months in a woman, a 3-para, aged 28. Her last period was dated 7th September, fœtal movements were felt at end of January, and delivery took place on 13th August. The fœtus was anencephalic. It is evident that the narrator reckons the period of gestation as dating from the cessation of the menses to the date of delivery.

3. The following case may be reckoned as a case of prolonged gestation, but differs from the two former in that labour did not come on naturally, in fact, did not come on at all, and abdominal operation had to be resorted to. It is,

[1] *Op. cit.* vol. iii. 370. [2] *Journ. Amer. Med. Assoc.*, May 14, 1898.
[3] *Medicinsk Obosrenie*, No. 2, 1896; and *B. M. J.*, vol. i., May 29, 1897.

therefore, very properly denominated a case of "missed labour." The case is recorded by Dr. Mary Scharlieb,[1] and the main facts are as follows: Mrs. W., aged 29, had been married eight years, and had a normal easy labour with her first and only child, about seven years before her admission to hospital in September 1894. Her last menstrual period was in October 1893, and she thought she was pregnant, but was ill for some time with abdominal pain and fever, after which, till May 1894, she was fairly well. At this time, however, when she believed herself pregnant six months, she became so ill with cramp-like pains that she could neither lie down nor sleep, which confined her to her room for six weeks. After a short interval she had another attack of pain and fever, and she passed a shapeless mass of pink jelly about 2 inches in diameter, succeeded by blood clots. Her illness continued until the time of her expected confinement in July, but no labour came on. Early in September, she had hæmorrhage *per vaginam* which lasted for a week, this being followed by a thick yellow discharge, during which time she had a few sharp pains as of the first stage of labour. She was seen by a medical man who advised her admission into hospital. Her condition on admission was as follows: she looked very ill and worn, her temperature 102° F., pulse 120, respirations 26; the legs were swollen, the abdomen tense and œdematous, and enlarged beyond the ordinary size of pregnancy. Neither fœtal heart-sounds nor fœtal movements could be perceived. On being put under chloroform, the outlines of the fœtus *in utero* could be detected through her abdominal wall, but on examination *per vaginam* no sign of cervix or os uteri could be discovered at first, although, later, behind and above the symphysis pubis, a narrow slit was found. Abdominal section was performed, when the pregnancy was found to be uterine, and the uterus to be adherent to intestines and abdominal parietes. On opening the uterus, an intensely fœtid purulent fluid poured out, and the fœtus was then extracted. It was large, well-developed, and weighed about 12 pounds. It had been evidently dead for some time, from its macerated appearance. The placenta was disorganised. The woman died on October 25th.

This case is unique in that a fœtus had fully developed *in utero* without the natural onset of labour. It is probably unique in literature, inasmuch as the pregnancy was verified by operation.

The following case, bearing upon this question, but from the opposite point of view, presents some points of great interest. The facts had to be reviewed by reason of an action of affiliation or paternity in the Glasgow law-courts against the reputed father. The facts were these: a young woman—a servant-maid—was delivered of a male child on the 14th January 1886, which, upon examination, bore all the marks of maturity. The infant was plump, the finger and toe-nails were well-developed. Her statement was that intercourse between her and the defender took place only on one occasion, and that on the 28th May 1885. She was able to fix this date because she had come into Glasgow on that day from her place in the country to be re-engaged at the hiring-fair held on that day, and it was at the fair she met the defender. That was not denied by the defender either as to date or the intimacy. The question for consideration was: Could a child, the result of fruitful intercourse on the 28th May 1885, be born mature on the 14th January 1886? The number of days between and inclusive of these dates is 231, and, *primâ facie*, the answer would be in the negative. On inquiry, the girl declared that she felt life at three months—a somewhat unusual circumstance—and on further inquiry as to her menstrual cycle, it came out that her menstrual periods had always been shorter than those of other girls—a fact that was corroborated by her mother. The interval was sometimes only 14, sometimes 17, and, occasionally, 21 days, and the menstrual flow usually lasted for 4 days. If the average of these cycles be taken, viz.: $18+21+25 \div 3$ we arrive at an average cycle of 21 days, and multiplying that figure by ten, 210 days. But if an allowance be made for the likelihood of there being more of the longer intervals than the shorter, we must conclude that the figure actually found is quite compatible, *in her case*, with the birth of a mature child. The Sheriff decided the case in her favour, and gave decree as craved.

Velpeau[2] remarks that the menstrual interval may be only 22, 20, 18, or even

[1] *B. M. J.*, vol. ii. 1898, p. 785.

[2] "Midwifery," p. 87.

15 days, and he adds that he knew one woman who was never more than twelve days free from the flow, and, on the other hand, others who were regular every 32, 35, or even 40 days; and Davis[1] avers that many women menstruate at intervals of from 24 to 20 days. Other observers, also, record like odd cases.

Blackstone[2] remarks "that all children born before matrimony are bastards by our law; and so it is of all children born so long after the death of the husband, that by the *usual course of gestation* they could not be begotten by him. But this being a matter of some uncertainty, the law is not exact as to a few days." It may be taken, therefore, that while the law considers about 280 days to be the normal period of gestation, evidence may be led to show reason why, in a given case, the period may be protracted beyond it. If we turn to the law of other countries, however, we shall find that those limitations are more strictly defined. The Common Law of Prussia, for example, recognises "no pregnancy as of longer duration than three hundred and two days,"[3] and the Rhenish Civil Code restricts the limit to 300 days. In France, 300 days is reckoned as the outside limit of the duration of pregnancy. According to the Civil Code of France, sections 312, 314, and 315, a child born in wedlock has the husband for its father, unless the father disavows it and can prove that from the 300th to the 180th day before its birth, he had not been able, either by reason of absence or physical impossibility, to have connection with his wife. Further, the legitimacy of a child born 300 days after dissolution of marriage may be contested.

Legitimacy and Illegitimacy.—Every child born in lawful wedlock or within a given period after the death of the husband has the husband for its father, unless such can be disproved in a Court of law. A child born of an unwedded mother, becomes legitimised in Scotland on the marriage of the mother to its father, but it is not legitimised by the same circumstances, in England. This difference is markedly defined in such cases as those in which a male child, so legitimated by the law of Scotland, becomes legal heir to the estates of his father in Scotland, but cannot be recognised and served as heir to any estates in England. This was the decision of the House of Lords in 1840, in the case of Birtwhistle *v.* Vardell. In this connection, also, the case of Dalhousie *v.* M'Donall, tried in the House of Lords in 1840, may be studied. According to Erskine,[4] in the law of Scotland, "to fix bastardy on a child, the husband's absence must continue till within six lunar months of the birth, and a child born after the tenth month is accounted a bastard." But there is a much narrower aspect of the subject than this, viz.: where a child is born of a married woman and during the subsistence of wedlock, under such circumstances of inability of access of the husband that it may be presumed, *a priori*, that he cannot be its father.

Further it is the law of England that a child conceived in wedlock, but born after the death of the mother, is the legitimate offspring of the union. While, technically, the death of the mother dissolves the

[1] "Obstetric Medicine," p. 252. [2] "Commentaries," vol. i. p. 456.
[3] Casper, *op. cit.* vol. iii. p. 361.
[4] *Institutes;* and *Ed. Med. and Surg. Jour.*, vol. i. p. 334.

marriage, in practice, the living child, extracted from her body by Cæsarean section, it may be, or by manual operation, after she has ceased to live, is as legitimately the product of the union as if she had given birth to it while alive.

In many cases of legitimacy, judgment is arrived at from the moral evidence and without medical evidence being necessary. But medical evidence is usually required in cases where, for example, the condition of the husband from physical disability is presumptive of his inability to procreate, or where, by reason of the impossibility of access, a child was born at such an interval of time after the last possible opportunity, that he denies paternity. Thus the questions of impotency and of duration of pregnancy, which have already been discussed, are involved. Most usually, however, cases centre round the latter question; therefore the subject will be better elucidated by giving the facts of a concrete case which was tried in the Law Courts of England, and in which evidence on the possible protraction of gestation was led.

The following is a short summary of the Gardner Peerage Case. In March 1796, Alan Hyde Gardner, afterwards Lord Gardner, a naval captain, married a Miss Adderley, at Fort St. George, in the East Indies. They lived together as man and wife till January, 1802. On or about the 30th of that month the husband took leave of his wife, a few days later sailed for the West Indies, and did not return till the 10th July of the same year. It appears that about the end of 1801 his wife was suspected of adultery with one Henry Jadis, but it was not discovered by Captain Gardner till June 1803, after which he ceased to have intercourse with his wife. On 8th December 1802, Mrs. Gardner was delivered of a male child, unknown to her husband, the child being named Henry Fenton Gardner. In 1804, Captain Gardner prosecuted Jadis for criminal intercourse with his wife, and obtained damages of £1000 against him. He also got decree of divorce from his wife. Mr. Jadis thereupon married Mrs. Gardner in 1805, and the child, who had formerly received the name already given, was now acknowledged by them as their offspring, and took the name of Henry Fenton Jadis. In 1808, the father of Captain Gardner—Baron Gardner—died, and Captain Gardner succeeded to the title. In 1809, he married the Hon. Miss Smith, and of issue there was one son who was named Alan Legge Gardner, and a daughter, the former being born on 29th January, 1810. Lord Gardner died in London on January 5th, 1816. The son of the divorced wife of Captain Gardner and Jadis attained his majority in 1815. The legitimate son of Lord Gardner and his second wife, now a lad of 14 years of age, petitioned the King for recognition of his right to his father's title. This was opposed by Henry Fenton Jadis, who again resumed the surname of Gardner, on the ground that he was the true heir. Apart from the question of the adulterous conduct of Mrs. Gardner, the mother of Jadis, the question for the consideration of the Committee of the House of Lords wholly turned upon the duration of pregnancy. On this point, the evidence of seventeen medical witnesses was tendered to the Committee. During the hearing of the case it was proved that, between the late Lord Gardner and his first wife, there was a possibility of access on the day he left her, the 30th January, 1802, and from that day till the day upon which he sailed, the 7th February, but not from the last date until after the 11th July, the date of his return; consequently the following questions had to be considered by the Committee, viz.: Could a child, born on the 8th December, have been the result of sexual intercourse on the 30th January previously—a period of 311 days; or, from the 7th February to the 8th December—a period of 304 days: or, was a child begotten on the 11th July viable on the 8th December—a period of 150 days? The principal question, however, put before the medical witnesses for their consideration, had special reference to the possibility of protracted gestation to such an interval of days, as 311, or 304. Unfortunately, the medical evidence given was of no assistance to the Committee. Of the seventeen witnesses, five—Drs. Gooch, Blegborough, Davis, Pennington, and Sir Charles M. Clarke—stated that the duration of pregnancy lasted between 39 and 40 weeks; and twelve,—

Drs. Granville, Conquest, Blundell, Merriman, Power, Hopkins, Dennison, H. Davis, Elliotson, and Messrs. Sabine, Channocks, and Hawkes—were of opinion that while the usual period was about 40 weeks, it might be protracted beyond that period. Dr. Granville, in his evidence, instanced the case of his own wife. She passed her menstrual period on 7th April, quickened on 15th August, and although labour was expected early in January and pains then came on but subsided, she was not delivered until 7th February—that is a period of 306 days if the day before the expected period in April is reckoned, or 318 days if the time from the middle of the period in March and that of April which did not come is calculated. He further said that he had seen other cases of 290, 300, and 310 days' duration. Dr. Merriman deponed that he had seen cases of 285, 287, 296, 303, and 309 days, respectively. Mr. Sabine spoke to the case of his own wife. She menstruated last on 14th September, quickened in second week of January, and was not delivered till 14th August. Of this last case, it is quite clear that if the pregnancy be reckoned as from the period succeeding that of September, the period would only work out as about ten calendar months, and even from the middle of the time, as ten and a half months. One of the witnesses who was there to depone to his belief in the protraction of the period of pregnancy, distinguished himself by expressing somewhat novel views on the subject. He said he was of opinion that the normal period for male children was 290 days, and for females, 280; and when the Solicitor-General asked him: What of a hermaphrodite? he replied: "*that* I should take between the two."

It does not require to be said that the Committee ignored the medical evidence, and decided against Jadis on the ground of the well-established adultery of his mother.

For fuller accounts of the medical evidence, the reader who desires to pursue this subject ought to consult the following writings: Lyall's "Medical Evidence relative to the Duration of Human Pregnancy, as given in the Gardner Peerage Case"; *Edinburgh Med. and Surg. Journal*, vol. xxvii. p. 109; and *Med. Chirurg. Review*, vol. ix. p. 170.

In America, cases have been decided in which children born after a pregnancy of 313 and 317 days respectively were deemed to be legitimate.

One of the most interesting cases of short pregnancy which has been tried in Scotland was one in which, for ecclesiastical purposes, the Reverend Fergus Jardine sought to establish the legitimacy of a female child which was born to him and his wife, 174 days after their marriage.

Signs of Recent Delivery.—Although this subject might have been discussed under Concealment of Birth or Pregnancy, it is, perhaps, most fitting that it should be considered as a part of the general subject of Pregnancy.

It is frequently required of the medical practitioner in such charges as the above-named to examine an accused woman as to whether or not she has been recently delivered. The following, therefore, may be taken as the signs of recent delivery within eight to ten days thereafter:—

A. In the Living Subject.

(*a*) Symptoms of general indisposition. These include an anæmic condition of body, a soft, quickened, and compressible pulse, and sunken eyes, with dark areolæ.

(*b*) Enlargement of the Mammæ. These are found to be more or less full, firm, turgid, and knotty, and a milky fluid or colostrum may be expressed from the nipples. The surface veins are dilated and marked, and there is a more or less dark-coloured pigmentation round the nipples. The colour-tone of

the pigmentation varies; in blonde women, it is usually light in colour, in brunettes, it is almost blackish.

(*c*) Altered Conditions of Abdomen. In multipara, the skin of the abdominal parietes is flaccid or flabby, and may even be thrown into folds. In primipara, this condition of flaccidity may not be so marked, due in large measure to the better tone of the abdominal structures, and the extent of distension. There are usually *lineæ albicantes* present—although the colour will likely be pinkish, not white—due to the distension, and there is likely to be some degree of pigmentation, chiefly in the neighbourhood of the umbilicus and median abdominal line. At the lower end of abdomen—usually just a little above, or behind, the symphysis pubis—the uterus may be felt on palpation like a fœtal head, or an enlarged cricket ball.

(*d*) Changes in Vagina and Os and Cervix Uteri. The following conditions are likely to be found :—

1. There will be a bloody, serous, or muco-purulent lochial discharge which will soil the examining finger.
2. Appearances of bruising or laceration of external genitals, usually consisting of rupture of the fourchette, swelling of the vulva, and, perhaps, some degree of laceration of perinæum.
3. The os uteri will be more or less patent, usually to an extent sufficient to enable one or two fingers to be passed into it for a short distance ; its lips are likely to be swollen, and one or both of them may be lacerated or torn. By bi-manual manipulation, the organ will be found increased above normal size.

Where these appearances and conditions, or most of them, are found in any case, we may safely conclude that the woman has been recently delivered of a child, since no other like set of conditions are found from any other cause. But while these may be considered as the average conditions and appearances, it is necessary to state respecting some of them, that there may be a departure from the average rule. In cases of concealment of birth, for example, where it is the object of the woman to hide the occurrence, she usually goes about her ordinary work as usual. In such cases the woman is usually of robust health, and, therefore, the general signs of indisposition are likely to be awanting. Owing to the same fact, also, there is likely to be a longer continuation of the sanguineous lochial discharge, because of the woman continuing her duties while the uterus is of increased size, and as the result of gravity. Therefore it is necessary to review together the signs found, before pronouncing an opinion.

Signs of Recent Delivery in the Dead.—In an examination conducted upon the dead body of a woman, the examiner will not only discover such evidence as has already been given, but he has all the advantages which a dissection of the body may afford. In addition to the foregoing examination, therefore, his duty will be to make a careful examination of the uterus and vaginal tract, more especially in cases where criminal abortion is believed to have been practised by instrumental interference (in which case it is absolutely necessary that the

whole of the utero-genital tract should be removed entire for the purpose of a complete examination of the parts in a good light, after a careful vaginal examination has been made), for the purpose of discovering any wounds. The uterus will be found enlarged, its cavity, depending upon the stage of pregnancy, to be from 2 to 10 inches in length and to contain coagula, and the site of the placenta will be marked by a darker colour. The interior of the organ, especially in the neighbourhood of cervix and of the pouch of Douglas, should be carefully inspected for punctured wounds. We have had to make post-mortem examinations on the bodies of two women, recently delivered, owing to charges of mal-praxis, in one case against a medical practitioner, in the other, against a midwife. In the first case, there was a rupture of the perinæum, which did not, however, open into the rectum. The torn edges were in a sloughing condition. The uterus was several times larger than normal, the whole of its posterior and lateral aspects showed inflammatory action, and general peritonitis was present. On removing the uterus and vaginal tract entire from the body, no wounds of a penetrating character were found, but there was a ragged condition of the cervix. Section of the uterus revealed a cavity of $9\frac{1}{2}$ inches, and the placental site was well marked. The death was evidently due to septic metro-peritonitis. In the second case, death was evidently due to apoplexy occurring during labour. On the surface and in the substance of the upper and back part of the brain was a considerable apoplectic extravasation of blood, and on section of the brain itself at this part, the brain substance was filled by a clot about the size of a walnut. The uterus was found of large size, and on section after removal from the body, two placentæ were found *in situ*. There was no unusual appearance about the neck of the uterus, or in the vagina, other than those consequent upon an ordinary labour. The body, generally, was œdematous. This girl, who was a domestic servant, died in the house of a midwife, whither she had gone to be confined.

Signs of Previous Pregnancy.—The signs found will depend upon whether the woman has been primiparous or multiparous. Especially in the latter, but also in most cases of the former, the following signs, or some of them, are likely to be found:—

(*a*) *Lineæ albicantes* on abdomen and mammæ, the result of the hyper-distension;
(*b*) Persistent dark areolæ around the nipples;
(*c*) Rupture of fourchette or perinæum, or both;
(*d*) Perhaps, a ragged, or notched condition of os uteri;
(*e*) Absence of signs of virginity, and non-rugose condition of vaginal walls.

The examiner, however, must be prepared in exceptional instances to meet with cases where a woman who has borne more than one child may exhibit on her body none of the above signs, or but little evidence of them. Montgomery[1] narrates a case in which he examined a lady who had borne five children and nursed three of them, and he found that "her breasts were small, but neither flaccid nor

[1] "Cyclop. Pract. Med.," vol. iv. p. 504.

"Labour in a Bicornate Uterus: Uterus Didelphys and Double Vagina."
By C. R. Jardine Glas: Med Jour. Vol 57, June, 1902 p. 447
" Case of Uterus Septus " S. A. W. Russell. in same vol. p 452

pendulous; the nipples short, with not the least shade of brown colour in the areolæ, which exhibited only the delicate rose colour so often observed in that part of the virgin breast; there were neither lines nor spots of any kind on the abdomen; the *os uteri* was small and natural; the vagina contracted, and the fourchette perfectly entire." This lady, however, never carried her children beyond the end of the eighth month. In 1887, we examined a married woman, aged 30, who was brought to the Police Station for a lacerated wound of the back of the head which she had got by falling, and for threatened miscarriage. Her breasts were in a virgin condition; there was a total absence of *lineæ albicantes*, and of pigmentary deposit around the nipples. The woman had borne four children, and had nursed each of them for nine months, her youngest child being three years of age.

Superfœtation.—This is one of the questions which is a legacy from ancient medico-legal writers. By the term itself is meant the conception of a second fœtus during the currency of an already existing pregnancy. Originally it was thought that such second conception could take place almost at any time during the currency of pregnancy. That notion was based upon the fact that, occasionally, at the birth of a full-time child, a second fœtus was shed from the uterus, but in a much less advanced state of development, and it was concluded, therefore, that the conception of the second had taken place during the currency of the uterine development of the first. Further, there were certain rare cases in which, one child being born at, or nearly at full time, a second was born at some period subsequently, and short of the time necessary for a fresh conception to have occurred in the interval. But both classes of cases are open to a different explanation; those of the former, as cases of twin conceptions in which the life of one had ceased at some period in the earlier stages of development. On one occasion, we delivered a woman of a healthy full-term child, and along with it a second fœtus which was pressed perfectly flat, and which, from its appearance, was judged to be about the fourth month of development. It appeared on inquiry that, at the time the woman was at this stage of her pregnancy, she fell down a steep, long, spiral, iron stairway, and received severe injuries, accompanied by serious vaginal hæmorrhage, which, however, ceased after a few days. There could be little reasonable doubt, therefore, that the second fœtus had been then killed, or that it died from separation of that part of placenta by which it was nourished. The latter class of cases may arise where the woman has a bi-locular, or bi-cornate uterus, a condition which is by no means uncommon, and of which many cases have been recorded. Pruvost[1] reports the case of a woman in whom, at her first labour, a double uterus with double os was detected. At her second pregnancy which came on at the eighth month she was delivered of a child, and the pains recurring a few hours later, the other half of the uterus discharged some decidua. In her three following pregnancies, the halves of the uterus alternately became pregnant, and from the opposite half followed some decidua. Roberts[2] reports an interesting case of *uterus bicornis unicollis*, in which, from the one half of the uterus a 4½ months' fœtus was discharged, and from the other, a

[1] *Progrès Médical*, May 1, 1897. [2] *B. M. J.*, vol. i. 1900, p. 1282.

decidual cast. This woman had already been delivered of three full-time children before the condition was suspected. In such cases as the foregoing, therefore, superfecundation is quite possible.

The following propositions may be laid down as substantially established:—

Of Superfœtation:—

1. That, setting aside the element of self-deception on the part of a woman, the great bulk of supposed cases are but twin pregnancies, in which the development of one fœtus has been arrested.
2. That, in a mono-locular uterus, from a few days after conception, it is physically impossible for a second ovum to become impregnated, except where the impregnation of an extra-uterine and of a uterine ovum simultaneously occurs.[1]
3. That of the cases published, there is no evidence to clearly demonstrate that, after a woman has been pregnant for some weeks, a second conception has occurred in a mono-locular uterus.

Of Superfecundation:—

1. That this is a possible contingency in a bi-locular uterus.
2. That a double conception may take place in a bi-locular uterus at varying intervals of time, or, one conception in one half of a bi-cornate uterus, and the other, extra-uterine.

Post-Mortem Delivery.—The question may be raised some day in a Court of law whether, in the case of a child which has been extracted alive from the mother's uterus after her apparent death, the husband would be entitled to be put in possession of the estate of his wife during the minority of the child, assuming that it lived through all that period. According to a very ancient decision, he would not be entitled. Such a case would undoubtedly raise important issues as (1) whether or not the mother was actually and legally dead at the moment of birth, some of the signs of apparent death being present, and (2) whether or not, the physical appearances of extinction of life being present, there was not physiological life still present in her body sufficient to permit of her child being born alive. The question of the life or death of the mother would legally hinge on these two points. Since the existence of the child *in utero* is held to depend upon the existence of the mother, the question may be pertinently put, Does not the very fact of the live birth of the child involve the fact of the existence of life in the mother? That live children have been born by Cæsarean section after the apparent death of the mother is unquestionable. It therefore becomes a serious question for a medical practitioner to consider whether, when a mother dies near the full term of her pregnancy, he should give the child a chance of living by this method, or let it die with the mother. The following cases show the possibility of extracting a live child under these circumstances:—

The late Dr. Harley in 1850, in the Royal Maternity Hospital, Edinburgh, performed Cæsarean section in the case of a young woman who had died suddenly from spasm of the glottis while anasarcous from cardiac disease. The child, which was a male, measuring 18½ inches and weighing 6 lbs. 12 ozs., lived and grew up to manhood.[2] Under the same reference, is narrated a case reported by Sandberg of Christiania, in which he operated on a woman who died on 18th August in eclampsia, and delivered her of a child under 4 lbs. in weight and not 16 inches in length. It was placed in a *couveuse*, and it was living in October when

[1] *B. M. J.*, vol. i. 1896, p. 1323. [2] Ibid., vol. ii. 1896, p. 1596.

he published his report of the case. Kirch[1] relates the following remarkable case. He was called by the friends of a woman, who, they said, had died suddenly about three-quarters of an hour after giving birth to a child. The woman was 40 years of age, and was the subject of mitral disease. Kirch went at once. He found her quite dead. The first child, which was born alive, was being attended to by a nurse. On making an examination of the woman, he found a fœtal leg projecting from the vulva, and he at once extracted the entire fœtus, which was born asphyxiated, but which revived, however, although it only lived for a few hours. From a consideration of the whole facts of the case, Kirch concluded that this second child was delivered 19 minutes after the death of the mother. Brotherston[2] relates a case in which he performed the Cæsarean operation on the body of a woman, and extracted 23 minutes after her death a large, healthy, female child in a state of asphyxia, but which survived, and was, as he writes, "as fine and healthy a child as I have seen." Blattner[3] states that he delivered a living asphyxiated child, *one hour* after the death of the mother, which, however, only breathed for ten minutes, and then died.

Whatever might be the judgment of our law on this point to-day, it is worthy of note that in the days of Numa Pompilius, the law of Rome was that the body of no pregnant woman was allowed to be interred, whether she died in labour or not, until the child had been extracted from her womb.

Criminal Abortion.—The law does not recognise any difference between what is known in medicine as an abortion or miscarriage and a premature labour, nor does it now take any cognisance of the fact whether the criminal expulsion of the product of conception was produced before or after the period of quickening. The law is set down in 24 & 25 Vict. cap. 100, sections 58 and 59.

"58. Every woman, being with child, who with intent to procure her own miscarriage, shall unlawfully administer to herself any poison, or *other noxious thing*, or shall unlawfully use any instrument or other means whatsoever, with like intent, and whosoever, with intent to procure the miscarriage of any woman, *whether she be, or be not with child*, shall unlawfully administer to her, or cause to be taken by her, any poison or other noxious thing, or shall unlawfully use any instrument, or other means whatsoever, with the like intent, shall be guilty of felony, and being convicted thereof, shall be liable at the discretion of the Court, to be kept in penal servitude for life, or for any term not less than 5 years, or to be imprisoned for any term not exceeding two years, with or without hard labour, and with or without solitary confinement.

"59. Whosoever shall unlawfully supply or procure any poison or other noxious thing, or any instrument or thing whatsoever, *knowing that the same is intended to be unlawfully used, or employed, with intent to procure the miscarriage of any woman, whether she be with child or not*, shall be guilty of a misdemeanour, and being convicted thereof, shall be liable, at the discretion of the Court, to be kept in penal servitude for the term of three years, or to be imprisoned for any term not exceeding two years."

It is also the law of Great Britain and Ireland that any one who produces criminally the abortion of any woman from the effects of which she dies, is guilty of murder. Mr. Justice Phillimore, in his charge to the jury in the Whitmarsh case (*vide post*), stated the law clearly as follows: "If the unfortunate woman caused her own mis-

[1] *Centralblatt für Gynëk.*, No. 25, 1900. [2] *Edin. Med. Jour.*, April 1868.
[3] *American Jour. of Obstet.*, vol. viii. p. 160.

carriage, then, so far as she was concerned, it was in law a case of suicide, or *felo de se*. If the prisoner were her accomplice in that, if he were present aiding and abetting an illegal operation which caused her death, though he did not actually use the instrument, he was equally responsible for her death. If he were there, or encouraged or assisted her by getting a room, he would be what the law called a principal in the second degree. If he merely urged or counselled, and was not himself present at the illegal operation, he would be what the law called an accessory before the fact, and would still be guilty of murder." Mr. Justice Darling, in referring a case to the Grand Jury, Chester Assizes, March 6, 1899, in which a prisoner was charged with the murder of a woman, whose death, it was alleged, was caused by an illegal operation to procure abortion, pointed out that, though the law as it stood considered such a person, after conviction, guilty of murder, in view of recent cases in which sentences of death had been passed on persons in like position to the prisoner, but which had been commuted, he would advise them to put an end to such an unsatisfactory state of the law by telling them that, if they found from the evidence that the object and intention of the prisoner in this case was not to kill the woman, but simply to produce abortion, they should not return a true bill for murder. The theory of "constructive murder," as it is termed, requires remodelling and further delimitation. The foregoing judgment of Mr. Justice Darling was evidently due to the fact that, although Heap was hanged in 1875 for this crime, Whitmarsh who was also sentenced to death, had his sentence commuted by the Home Secretary to a term of twelve years' penal servitude, and Collins, although he was found guilty of manslaughter, to a term of seven years' penal servitude only.

It will be observed from the previous statement of the law that the criminality or *culpa* of the act lies in the *intent* to procure abortion, and it, therefore, follows that the person upon whom the intentional procedure has been practised need not even be pregnant. Neither do the provisions of the statute in terms make any allowance for the medical practitioner, who, with intent, brings about premature labour, from the effects of which a woman may die, with the object of saving the life of the mother from some concurrent condition or disease. It is quite true that the act must be performed with distinct felonious intent, for the law in practice recognises that the operation may be required in certain justifiable circumstances. But in order to protect himself, the medical practitioner, when he deems such an operation urgently required, ought to ask and obtain, after consultation, the concurrence of another medical man, and, if possible, the consent also of the husband, after explaining to him the situation. These are precautions absolutely essential, since prosecutions have arisen under circumstances in which no such care was exercised, as the following cases will show.

1. Dr. Wallace was tried at the Kent Assizes, in 1898, for the alleged performance of an illegal operation on a girl. It was alleged that the accused had taken advantage of the unconscious condition of the girl at his surgery some two and a half months before, and that this was the motive cause of the above operation. It was shown in evidence, (1) that the said operation was performed while the mother of the girl was present, and (2) that she suffered from a uterine ailment,

for the rectification of which the accused used the uterine sound, in ignorance of the girl's pregnancy. Mr. Justice Hawkins, in his summing-up of the case, said, "No man would be safe if he depended for his liberty or character upon evidence which was not absolutely conclusive against him, particularly when his record was a good one." The accused was found not guilty.[1]

2. A medical man in Edinburgh was apprehended, kept in gaol for two weeks, and liberated without further proceedings being taken against him, under the following circumstances. At the end of February, he was asked to visit a young girl who was unknown to him. She confessed to him that, having discovered that she was pregnant, she had taken drugs to procure abortion. At his visit, the miscarriage was proceeding, and on account of severe hæmorrhage, presumably, he felt it to be his duty to prescribe ergot. The girl not getting relief, he considered it necessary, in order to save her life, to perform an operation. Through indiscretion on the part of the girl herself, who got up and drank spirits, she took peritonitis of which she died. It was subsequently found out that prior to the accused being called, the girl had been visited by two men, described as medical students, who, it appears, had in some way treated her, and, it was declared, even performed an operation. No word of apology or explanation was offered to the accused by the authorities.[2]

3. Dr. Harris along with a woman named Espelby was charged with conspiring to use an instrument with intent to procure abortion. A true bill was found by the Grand Jury, but after trial by the Petty Jury, he was found not guilty.

Modes of Producing Abortion Illegally.—From the terms of the statute, it will be apparent, that though the illegal employment of a poison, other noxious thing, or an instrument is condescended upon, "any other means whatsoever" will embrace any other mode which might not be comprehended under any of the named causes.

From the medico-legal point of view, the methods may be divided into two main classes, viz.:—

I. The use of Drugs;

II. The use of Instruments.

I. *The Use of Drugs.*—Among quacks and other illegal practitioners, the employment of drugs is the favourite way of producing abortion, mainly because the sale or supply may be effected under circumstances incapable of legal proof, such as, for example, where the drug is handed by the seller to the buyer in the absence of witnesses, and where there is nothing on the packet or bottle indicative of its source. Among the ignorant many methods are employed, such as the free use of cathartic medicines, diachylon, savin, pennyroyal and steel, aloes, tansy, and other drugs, such as cantharides. Certain other drugs are employed by those who have obtained some imperfect knowledge of medicine by reading or otherwise, such as cantharides, ergot, the free use of quinine, an extract of cottonwood, or *actæa racemosa* or squaw-root. The better informed practitioner who has fallen into devious ways, and who knows the comparative valuelessness of drugs for this purpose, usually resorts to mechanical interference by the use of instruments.

Of late years, under disguised names, such as "female remedies for obstructions," "The Lady Montrose Miraculous Female Tabules," etc., an enormous traffic in abortifacient drugs has been discovered. This was revealed in the trial of the brothers Chrimes before Mr. Justice Hawkins at the Old Bailey, in January, 1899; that of "Madame

[1] *B. M. J.*, vol. ii. Dec. 1898.
[2] Ibid., vol. i. 1896, p. 987.

Gray," before the High Court of Justiciary at Edinburgh, 1897, and others.

All drugs having an abortifacient effect act in one or other of the three following ways, viz.: (*a*) by acting on the bodily system generally as a poison; (*b*) by acting locally and directly upon the muscular structure of the uterus; (*c*) by acting locally and indirectly upon the uterus through the gastro-intestinal or genito-urinary tract. It is likely that it is in the first way that savin and lead[1] act; in the second, ergot and quinine; and in the third, drastic purgatives, cantharides, and others.

The following references to cases tried in which drugs were used are important. In England, R. *v.* Calder, Exeter Lent Assizes, 1844;[2] R. *v.* Brown, Lewis Assizes, June 1878. In Scotland, 3 Hume, 1, 186, —case of Robertson and Kempt; Alison, 1, 629—case of Munn; More, II. 373.

II. *By the Use of Instruments, or by Mechanical Violence.*—Violence may either be applied generally to the abdomen, or locally to the uterus. Cases are comparatively rare under the former head, and, therefore, the following attempted case from Tardieu is of some interest.[3] A peasant seduced his servant, in consequence of which she became pregnant. Desirous of producing abortion, he mounted on a strong horse taking the girl with him, and galloped wildly to and fro, throwing the girl to the ground on repeated occasions while the horse was in full gallop. This did not succeed. Thereafter he applied to her stomach bread just taken from a very hot oven. But this proved equally unavailing; and eventually, the girl gave birth to a living and well-formed child at full time. In these days, interference takes the form of horse or bicycle exercise, dancing, tight-lacing, etc.

The criminal aspect of instrumental interference most usually takes the form of local uterine violence. The variety of instruments used is of wide range, such as hooks, knitting or crotchet needles, scissors, wooden skewers, sponges, syringing, intra-uterine injections, catheters, and the uterine sound.

The following cases may be taken as typical:—

1. Dr. Wherry of Cambridge[4] reports the following case, which is of interest in respect that the abortion is traced from commencement to finish. A young woman, aged 19, consulted a chemist in Cambridge named Ransome, and his wife a professed midwife, and took medicines with intent to procure abortion, but without the desired effect. On Sunday, Dec. 5, 1880, she was induced by these persons to submit to an operation at the hands of a man named Lepper, who came from London for the purpose. After payment of £10, Lepper passed up "a silver hook,"—as the girl described the instrument—which hurt her very much, and blood came away. No witnesses were present. A few hours later, a second operation was performed, which caused great pain and loss of blood. On both of these occasions, she walked a distance of more than a mile to the chemist's shop where the operations were performed. On the following day, Dr. Wherry was called, when he found that peritonitis had developed. On the 11th Dec., she was so ill that her deposition was taken. She, however, ultimately recovered. The prisoners were apprehended, tried, convicted, and sentenced to

[1] *B. M. J.*, vol. i. 1900, p. 1590.
[2] *Provincial Med. Journ.*, April 10, 1844.
[3] *Étude Médico-légale sur l'Avortement*, p. 27.
[4] *B. M. J.*, vol. i. 1881, p. 880.

five years' penal servitude. It is evident, in this case, from the symptoms induced, that the instrument had at least severely injured, if, indeed, it did not actually penetrate, some part of the vaginal wall, or uterus itself.

2. Dr. Collins was convicted on July 2, 1898,[1] on the charge of manslaughter for procuring abortion with a fatal result upon a married lady who did not want any more children. The evidence for the prosecution may be summed up in the following points, viz.: (1) That the woman died from septic peritonitis; (2) that there was a wound, situated about an inch and a quarter on the inner side of the anterior lip of the *os internum* caused by some blunt-pointed instrument, which was distant 5 inches from the mouth of the vagina, and which measured ¼ inch in diameter and ⅛ inch deep. It was a ragged, punctured wound, as if it had been made by a blunt, probe-pointed instrument of some kind, not by a sharp instrument; (3) that the condition of the womb corresponded to a pregnancy of seven to eight weeks, and showed evidence of recent abortion; (4) that the deceased knew she was pregnant, and was desirous to be rid of the product of conception; (5) that during the time Collins attended her—Collins being previously a stranger to her—she aborted. Collins was found guilty, and was sentenced by Mr. Justice Grantham to seven years' penal servitude.

3. Madame Gray was tried before the High Court of Justiciary at Edinburgh, in 1897, for having performed an illegal operation on a widow. She was found guilty, and was sentenced by the Lord Justice-Clerk to five years' penal servitude.

4. Alfred Thomas Heap, in 1875, was convicted of having criminally produced abortion, from which the woman died. He had produced the result by transfixing the uterus with a Manchester spindle, the woman dying shortly after the operation. He had been previously convicted of the same crime. He was convicted, and hanged for this offence.

5. Jane White, aged 67, a nurse, was found guilty of a like crime at the Central Criminal Court, London. The woman upon whom she operated died of peritonitis. At the post-mortem examination, a lacerated wound was found in the uterine region, which, in the opinion of the examiners, had been caused by some hard, or blunt instrument, probably a catheter. White was sentenced to death, but was reprieved afterwards.[2]

6. Sarah Ann Eden was convicted at the Warwick Assizes on Dec. 10, 1895, for having caused the death of a married woman by procuring abortion. She was condemned to death. The dead woman was the mother of six children, and it was shown in evidence that she had first tried to persuade her usual medical attendant to bring on abortion, but having failed to do so, she had recourse to his midwife, who in doing the operation caused her death.[3]

7. Dr. Whitmarsh was convicted of having caused the death of a young woman, aged 26, by performing upon her an illegal operation with the object of procuring abortion. It would appear from the evidence of the dying declaration of the woman that the accused passed an instrument, and then injected some fluid. Symptoms of mercurial poisoning supervened. The post-mortem examination by Mr. Bond showed that the whole of the mucous membrane of vagina and uterus was found to be in a sloughing condition; the uterus was enlarged to a condition corresponding to the period of gestation reached at the date of the alleged abortion; the breasts were found to contain a little milk; the lower gum was found to have sloughed, and the alveolus of the lower jaw was bare. On analysis of the liver by Dr. Stevenson, mercury was found. Whitmarsh was found guilty of murder, was sentenced to death by Mr. Justice Bigham, but the sentence was afterwards commuted to penal servitude for life.

8. Drs. La Jarrige and Boisleux were convicted at Paris in 1897, for having caused the death of Miss Thomson by performing an illegal operation, the effect of which was to produce abortion. Rupture of the uterus was found by Prof. Brouardel on post-mortem examination of the body. This case is peculiar in respect that the accused had performed laparotomy on the deceased. It does not appear perfectly clear from the evidence that there was any allegation made that the accused performed the operation with the object of criminally procuring

[1] *B. M. J.*, vol. ii. 1898, pp. 59, 122.
[2] Ibid., vol. i. 1899, p. 448.
[3] *The Lancet*, vol. ii. 1895, p. 1518.

abortion, although they were distinctly charged with not having used sufficient care in ascertaining whether or not the woman was pregnant; and one of the witnesses stated that the fact that the woman was pregnant was known to the first-named accused. The jury found them guilty, and they were sentenced to five years' imprisonment.

Other cases might be cited, but the preceding are sufficiently illustrative.

For Scottish cases, consult Hume, i. 187, case of Robertson and Bachelor; Alison, i. 628, case of Aitken; and 3 Irvine, 235.

The practical point to be considered now is: Upon what must medical evidence of criminal abortion depend? The following must be taken into full and careful consideration before an opinion is offered, viz.:—

(*a*) The history of the woman;

(*b*) The examination of her body, living or dead;

(*c*) Inspection of the aborted material, when available.

It is important at the very outset of this inquiry to remember that, although criminal abortion is most usually practised at or about the fifth month of pregnancy, since it is then that the woman becomes certain of her pregnant condition by feeling the movements of the fœtus *in utero*, it may be induced at earlier periods, especially in the case of married women, whose experience lead them to an earlier knowledge of their state, than in the case of a woman who is pregnant for the first time; further, that an attempt to procure abortion may be made upon a woman who is not pregnant at all, but who fears that she is because her menses have ceased.

1. The History of the Woman.—In many instances, this may not come within the purview of the medical examiner. But where there is a history of the use of distinctly abortifacient drugs, or of other drugs used inordinately, such as drastic purgatives or cathartics which would not ordinarily be used in such quantities or so repetitively, and which when so lavishly used may produce abortion by sympathetic or reflex action through exalted peristalsis, suspicion at least ought to be awakened.

2. The Examination of the Woman's Body.—(A) *During life.*—When opportunity offers, the examination must be made early, owing to the comparative rapidity with which the signs of delivery in the earlier months of pregnancy may disappear. In abortion, however, it very often happens that the ovum and decidua are not evacuated from the uterus in a state of entirety, and, therefore, signs of this will be left. The examination ought to be both tactual and visual. The finger may not be able to detect small breaches of continuity, but it will probably discover such changes in the "feel" of the mucous membrane of the os, and of patency of the os, as to indicate whether or not something may have recently passed by that route. Visual examination *per speculum* is of great value, for careful exploration of the vaginal tract is then likely to reveal any wounding if such be present. There are two prominent lines of symptoms which should awaken suspicion of criminal abortion, viz.: (*a*) those of septic poisoning associated with metritis, or peritonitis, or with partly both conditions, and (*b*) those of traumatic peritonitis. Either of these may be found after abortion where no criminal attempt has been practised, but there is usually some preceding history to illumine the point

issue. Such symptoms and signs as the foregoing, therefore, might be found where there has been an attempt to procure abortion, and in which there has been no pregnancy. Where the woman has been pregnant, or is still pregnant, the examiner must carefully look for the signs of it; as pigmentary areolæ round the nipples, enlargement of the breasts, milk in the breasts, absence of the hymen, bloody discharge from vagina, and patulous condition of os. (B) *After Death.*—Death may result where abortion has been criminally produced from the following causes, viz.: (*a*) Shock, directly consequent upon the internal injuries produced by the operation; (*b*) Hæmorrhage from the uterus and parts injured; (*c*) Septic poisoning, which may take the form of septic peritonitis, metro-peritonitis, or septicæmia; (*d*) Traumatic peritonitis; (*e*) Effects of poison, generally, on the system; and (*f*) in rare cases, Tetanus.

The examiner having noted the presence or absence of the signs of pregnancy externally visible upon the body, and having inspected the utero-vaginal tract both visually and tactually, should next proceed to the internal dissection of the body as in an ordinary case, but with special attention directed to the condition of the abdominal cavity and its organs. The first thing to note will be the presence or absence of inflammatory mischief in this cavity, and, if present, its incidence and extent of area and particularly if it be centred round special points. Before removing any of the parts from the cavity, careful search must be made for the presence or absence of any penetrating wounds of the peritoneum, and if present, their position and character with relation to the uterus and the parts penetrated must be noted. Thereafter, it will be well to scoop out of the body the entire soft contents of the pelvic cavity, by making incisions close to the bones, and then to proceed in a good light to the detailed examination of the whole parts, viz.:—

(*a*) The urinary tract, for the presence or absence of signs of irritant mischief, such as might be produced by cantharides or turpentine;

(*b*) The utero-vaginal tract, for evidences of internal wounding, the condition of the os and cervix, the uterine dimensions, and of the signs of pregnancy.

It is advisable, in those cases where there are no signs of local violence, that the condition of the gastro-intestinal tract should undergo strict examination for evidence of irritant poisoning, and where such is found, that the whole tract and its contents, along with the other organs of the body, should be placed in clean jars, which should then be sealed and kept as already indicated (*vide* p. 20), lest an analysis should have to be made.

3. The Examination of the Aborted Material.—From what has been said of the law on this subject,—that the criminality consists in the intent to procure abortion whether the woman be or be not with child,—it is generally sufficient to prove by dissection, where death has been caused, that the uterus has been recently evacuated of pregnant contents, or by local examination where the woman is living, for evidence of such uterine evacuation, and by general examination for the external signs of pregnancy. At the same time, any remanent

parts of the product of conception and of aborted material should be noted when found.

The very practical question, however, arises at this stage:—Allowing that abortion has been produced, has it been caused criminally?

It must be kept prominently in mind that abortion may be produced accidentally, from natural causes, or from disease. It is not necessary to discuss in detail the natural causes of abortion. As a general principle, liable however to exceptions, it may be stated that

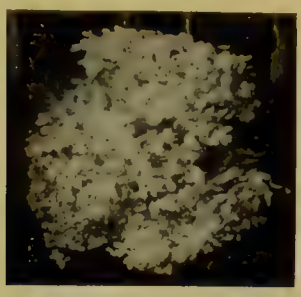

FIG. 79.—Abortion at Fourth Week. (From Hunterian Collection, University of Glasgow.)

FIG. 80.—Abortion at Tenth Week. (From Hunterian Collection.)

whatever cause tends to debilitate generally a pregnant woman thereby causes increased liability to abortion. Suddenly occurring febrile diseases, especially of the exanthematous type, such as small-pox, scarlet fever, influenza, enteric fever, typhus, etc., and specific diseases, especially syphilis, provoke miscarriage. Reflex irritation of the uterus from whatever cause arising, especially in connection with the gastro-intestinal and genito-urinary tracts; degenerative changes in the villi of the chorion, or in the placenta, especially of the fatty type; and accidental hæmorrhage between uterine wall and placenta, are all well-known provocative causes, in addition to malpositions of the uterus itself, not to speak of the effect in some women of explosions of the emotions, as anger, grief, or joy.

FIG. 81.—Abortion between Sixth and Eighth Week. (From Hunterian Collection.)

Abortion may also be produced by apparently trifling accidents. This is true of many women. A false or miscalculated step from a height, a marked and sudden jar to the body, an accidental knock against the abdomen, may all produce it. At the same time, in other women, even serious abdominal injuries may fail to precipitate the expulsion of the ovum, even near the natural termination of pregnancy. We once attended a woman who in the last few days of her last month of pregnancy fell from a height on the comparatively sharp edge of a trunk. When the child was born a few days after—healthy and

Small K

strong—an ecchymosed mark, the size of an ordinary medal, was found on the abdomen of the child, which disappeared, as such marks usually do, about ten days after birth. Women have frequently been known to carry their children to full time even after serious accidents (*vide ante*).

Cases however arise from time to time in which, from attendant circumstances, medical practitioners may be compromised, but in which the abortion has been brought on by the woman herself, either by the self-administration of drugs, or by instrumental interference. Dr. Ransom[1] has described a series of cases in which women have taken lead in the form of diachylon with this object, and in whom symptoms of lead-poisoning were induced.

One young woman, aged 22, acknowledged that she had taken a quantity of diachylon which was equal to 23 grains of lead. He further records the histories of other cases occurring in the experiences of other practitioners where the same poisonous substance was taken with the same object, and gives references to other papers in which like cases are recorded. Other observers as Crooke,[2] Taylor,[3] Branson,[4] Wrangham,[5] and Schwarzwaeller,[6] have recorded examples of a similar use of diachylon or of another lead salt. Wrangham affirms that the practice prevails in Leicester, Nottingham, Birmingham, and Sheffield.

During the time the Collins case was occupying the attention of the medical press, various correspondents adduced evidence of cases in which self-induced instrumental abortion had been practised. In one case, a woman confessed to her medical man that she had brought on miscarriage on herself 35 times, by squatting herself down and passing a thick knitting-needle into the uterus.[7] In a second, where it was self-induced by means of a catheter, the practitioner found the patient bleeding profusely and some placental material projecting through the *os uteri*, as the result of the instrumental treatment.[8] In a third, where the woman, who had invited her medical attendant to perform this operation upon her but was refused, effected her object by means of a thick bone crochet needle. In a fourth, a young midwife pupil provoked abortion on herself by introducing a uterine sound into the uterus, followed by an intra-uterine injection, and died in 9 days from tetanus.[9] In a fifth, a woman who was acquainted to some extent with gynæcological methods of treatment, injected into her uterus a few drachms of glycerine (Pelzer's method), thus producing abortion, of which she died on the sixth day after.[10] In a sixth, a woman who believed herself to be two months pregnant, passed a glass penholder with a sharp grooved point into her uterus. She lost hold of it during the operation, and it disappeared entirely within the uterus. Some days later, she was seized with intense pain in the abdomen; the abdomen was opened and explored, and the penholder was found, point forward, nearly touching the central part of the diaphragm. The penholder measured $5\frac{7}{8}$ inches in length.[11] These cases need not be multiplied, but others have been recorded where a long hair-pin had been used.[12]

While, from the medico-legal point of view, it makes no difference with respect to the commission of the crime whether it has been provoked by the woman herself or by some one else, such cases as the foregoing ought to compel consideration in circumstances in which a practitioner is accused, because, as the history of many cases but too clearly reveals, a medical practitioner may be called in when the process has been initiated by the woman herself, to save the life of

[1] *B. M. J.*, vol. i. 1900, p. 1590.
[2] *The Lancet*, July 1898.
[3] *The Lancet*, September 1898.
[4] *B. M. J.*, December 1899.
[5] *B. M. J.*, vol. ii. 1901, p. 72.
[6] *Berl. Klin. Woch.*, February 18, 1901.
[7] *B. M. J.*, vol. ii. 1898, p. 749.
[8] Ibid., p. 657.
[9] *Ann. de Gynéc. et d'Obstét.*, June 1899.
[10] *Brooklyn Med. Journ.*, July 1899.
[11] *B. M. J.*, vol. i. 1900, p. 1221.
[12] Idem, vol. ii. 1899, p. 187.

the woman from the consequences of her own illegal act. Should the woman chance to die without any confession or explanation that she herself had done this, and should a post-mortem examination be conducted upon her body, it is not difficult to apprehend the case with which the medical attendant will be compromised in the eye of the law, and how serious consequences to him may follow. Moreover, it is not compatible with the ordinary mode of conducting practice that a medical practitioner can always protect himself, since he cannot call for the services of a brother practitioner in cases of miscarriage on the off chance that one may be a case of criminally-induced abortion. It is, however, advisable that the practitioner should see that he is protected, by quietly arranging that a female neighbour or nurse should be called in so that she may be able to speak to the facts of the onset of the abortion, should, perchance, it prove a self-induced case. This is one of the undoubted risks to which members of the medical profession are exposed, as we have pointed out elsewhere.[1]

[1] *Glas. Med. Journal*, Sept. 1886.

CHAPTER XIII.

INFANTICIDE.

The crime of infanticide consists legally in the murder of a live-born, newly-born child. The law distinguishes the crime to be either by Omission, or by Commission.

Infanticide by Omission means the neglecting to do such things connected with the continuance of the life of a newly-born child, which may cause its death; as for example, neglecting to tie the umbilical cord after severance, since by omitting to do this the infant may bleed to death; or by neglecting to clothe it in a reasonable way so as to protect it from the cold; or by omitting to remove such obstacles as would prevent it from breathing.

Infanticide by Commission is the performance of any act against a live-born child which prevents it from living or which destroys its life.

The law on the subject has undergone many changes during the past three and a half centuries. By the 27 Jac. I. cap. 27, it was laid down that any unmarried woman who concealed her pregnancy, and the infant dying, was to be condemned to death. In the event of the dead body of a child having been found and the maternity traced to a particular woman, the burden of proof that the child was born dead lay upon her. In 1690, an Act of William and Mary, cap. 21,—which applied only to Scotland however,—enacted, in a charge of child-murder, a series of presumptions which the jury, in the absence of direct proof, were to consider as evidence of the commission of the crime. These presumptions were founded upon the following premises: (1) That the person charged had concealed her condition from every one during the whole currency of her pregnancy; (2) that she was without, and did not call for, any assistance at her delivery; (3) the discovery of a dead child; or the absence of a child, dead or alive. Many women were executed under this Act. From 1690, no new legislation on the subject was passed until 1803, when the Act known as Lord Ellenborough's Act—43 Geo. III. cap. 58—was passed. It arose because of certain doubts which had arisen respecting the true sense and meaning of the 27 Jac. I. cap. 27, and also of an Act of Parliament for Ireland made in the sixth year of the reign of Queen Anne, entitled "An Act to prevent the Destroying and Murthering of Bastard Children." This Act of George III. enacted that the "rules of evidence and of presumption as are by law used and allowed to take place in respect to other trials for murder" should prevail in a charge of child-murder. It also empowered the jury to find on the lesser charge of concealment of birth. The Act only applied to England and Ireland. In 1808, the 49 Geo. III. cap. 14

was passed. It repealed the Act of 1690 of William and Mary, and was applicable only to Scotland. It constitutes the present law in Scotland with respect to this crime.

It enacted "that if from and after the passing of this Act any woman in that part of Great Britain called Scotland shall conceal her being with child during the whole period of her pregnancy, and shall not call for and make use of help or assistance in the birth, and if the child be found dead, or amissing, the mother being lawfully convicted thereof, shall be imprisoned for a period not exceeding two years, in such common gaol or prison as the Court before which she is tried shall direct and appoint."

In 1828, by the passing of the Lansdowne Act—9 Geo. IV. cap. 31, sec. 14—the prosecutor was relieved from the necessity of proving in a charge of concealment of birth whether the child died before, at, or after its birth. The Consolidation Act—24 & 25 Vict. cap. 100—adopted and extended the above provisions.

Section 60 reads: "If any woman shall be delivered of a child, every person who shall by any secret disposition of the dead body of the said child, whether such child died before, at, or after its birth, endeavour to conceal the birth thereof, shall be guilty of a misdemeanour . . . provided that if any person tried for the murder of any child shall be acquitted thereof, it shall be lawful for the jury by whose verdict such person shall be acquitted, to find, in case it shall so appear on evidence, that the child had been recently born, and that such person did, by some secret disposition of the dead body of such child, endeavour to conceal the birth thereof, and thereupon the Court may pass such sentence as if such person had been convicted upon an indictment for the concealment of the birth."

This Act is the basis of indictments for infanticide in England and Ireland.

It will be apparent from the foregoing, therefore, that in England the alternative charge to infanticide is concealment of birth, whereas in Scotland, it is concealment of pregnancy. In every charge of infanticide, the law starts from the presumption that every child is born dead till proof of the opposite is adduced, the *onus probandi* falling upon the prosecutor.

It will be well at this stage to clear away certain terms by giving their legal definitions. The term "live-birth" in law has been in the past a great stumbling-block in the successful prosecution of cases of this crime. It ought to be said at once that its definition is judge-made and not statutory, but that it has equal force as if it had been made by Act of Parliament. Live-birth legally means the entire delivery of the child from the parts of the mother, and the maintenance of a circulation or life of its own independent of the mother.[1] This definition obtains although the child may still be attached by the umbilical cord to the placenta which may yet be within the uterus of the mother. In other words, the child must be living an independent existence before it can come "under the King's peace." For this reason, it has been decided that it is no murder to kill a child *in utero*, but should the child only be injured from the violence offered, be born alive, and should then die from the effects of the injuries, the person who caused such injuries is chargeable with murder.[2]

[1] R. *v.* Enoch, 5 C. and P. 539. R. *v.* Poulton, 5 C. and P. 329.
[2] R. *v.* Senior, 1 Mood. C. C. 346.

It has also been decided in the Supreme Court of Illinois that an infant which had been born with a deformity alleged to have been caused by injury to the mother while it was within the uterus of its mother, could not raise a suit of damages against the causer, because at the time of the infliction of the injury it could not be credited as a separate being capable of sustaining an action independent of the mother.[1]

It will thus be seen that the legal definition of live-birth differs from the medical definition in respect that the latter considers evidence of respiratory action of the child whether initiated partly within or wholly without the maternal parts, as indicative of live-birth. And it is precisely because of the difficulty, in this secret crime, of determining by the physical appearances of the body whether the respiratory function was carried on while part of the child was within the maternal parts, or while it was wholly without, that in so many cases the minor charge of concealment of birth, or of pregnancy, is returned as the verdict of the jury respecting the guilt of the accused. A child is held to be "newly-born" in law within fifteen days after its birth.

When may a child be declared to be still-born? The answer to this must be determined by the civil law as to live-birth, apart from a charge of infanticide or concealment of birth. It is quite clear from the evidence given before the Committee on Certification of Deaths that very loose notions prevail in certain quarters as to when a child is to be deemed still-born. But the question has arisen in a Court of Law in connection with a charge against a practitioner of alleged falsification of a birth certificate.

At the Sheffield City Sessions, January 11, 1901, a medical practitioner was charged under Section 40, sub-section 2, of 37 & 38 Vict., cap. 88, with the above offence. A number of witnesses stated that the child was born alive, about half-an-hour after the doctor left the house of the mother, who was then in labour, on the night of March 31, that they heard it cry, or make a whining noise, and that it died between three and six o'clock next morning. The accused gave a certificate stating that the woman had been delivered of a still-born child. The accused stated in his defence that the child was a six months' child, and that he inferred from that fact it could not be born alive. The jury gave the accused the benefit of the doubt, but stated that they believed he was guilty of gross carelessness in giving such a certificate. A verdict of "not guilty" was accordingly entered. It ought to be clearly understood that a child, whether at six months or nine months of uterine age, which manifests such signs of independent existence as would entitle it to succeed to an estate—for example, attempts at respiration, or the continuous action of the heart even for some minutes after birth, much more the act of crying—must be reckoned as born alive for the purposes of the civil law.

The following practical medico-legal questions are bound to emerge in the medical examination of a woman charged with the crime of child-murder, viz.:—

1. Has the woman charged been recently delivered?
2. Is the body of the child found that of a viable child?
3. Is the child found that of the person accused?
4. Was the child born alive?
5. If the child was born alive, what caused its death?

[1] *New York Med. Record.* March 1900; *B. M. J.*, vol. i. 1900, p. 659.

Having already discussed the first two queries (*vide* pp. 279, 280), it is not now necessary to deal with them. The only point that need be made clear now is, that unless the child born has reached such a stage in its development as made a living birth possible, no charge of infanticide, or of the minor charge, would lie against the accused.[1] Therefore the question of viability is of great importance.

3. Is the child found that of the person accused?

Proof on this point is most usually established from lay evidence, by persons of the prisoner's own sex, with whom she has been more or less intimately associated in work or social life. The medical examiner may assist in this matter by a careful examination of the wrappings which envelop the body of the child, as happened in a case in Glasgow in 1898, in which on the brown paper wrapping of the body was a nearly obliterated name and address which gave the necessary clue to the discovery of the mother, or of the nature of the ligature with which the umbilical cord is tied. The child's body, on the other hand, may never be found, in which case the death cannot be proved. In odd cases where the body is found and in which the child has lived for two or three days after its birth before being murdered, some evidence relative to identification may be obtained from observation of the condition of inflammatory area of separation of cord from abdomen. But such cases are very rare, as the deed is done usually at the time of the birth of the child, the object being to prevent it making its arrival into the world known.

4. Was the child born alive?

Proof of the child being dead before birth, or of being incapable of maintaining a separate existence, may be adduced from the following facts:—

(*a*) Evidence of immaturity or non-viability. Children less than the age of seven months of uterine development are medically considered, in the great majority of cases, to be incapable of maintaining a separate existence. And while there have been children successfully reared at less ages than the above, such has only been accomplished in exceptional cases and under exceptional precautions, and therefore need not be considered in this connection.

(*b*) A monstrous birth. Such is generally considered to be incapable of living a separate existence. But we must discriminate even in this, as it will entirely depend upon the character of the monstrosity whether maintenance of a separate existence is possible or not. (Fig. 82.) The Siamese twins, for example, lived for many years. But acephalous, anencephalous, hemicephalous, ectocardiac, and other teratological abnormalities usually die quickly after birth; but an anencephalous monster has lived for 61 hours after birth.[2] To kill a monster, or to prevent it from living, is murder in the eye of the law. (Figs. 82 and 83.) In addition to the case of the Siamese twins—Chang and Eng Bunker—who lived to the mature age of 63 years and who died within two hours of

[1] Hume, i. 298; Alison, i. 153.
[2] Onodi, *Monatsch. für Giburtsh. u. Gynëk.*, March 1900.

each other, other cases of double or, as they are termed, xiphopagous or thoracopagous twins, who have attained to comparatively mature years, have been recorded; as, for example, the cases of Radica-Doodica, Millie-Christine, and of Rosaline-Maria, twin sisters, and of Laloo, twin brothers. In some of these surgical operation to effect separation was

FIG. 82.—Case of Monstrosity. The child was born on 20th November 1888, and lived till 13th December: thus the child lived for a period of 22 days. The illustration gives a posterior view and shows that the monster possessed two heads, three arms, two legs with very deformed feet, and a curious caudal appendage. For the use of this and the other illustrations of the monster we are indebted to a former student who attended at the birth.

performed. For further information the reader may consult the following references named in the footnote.[1]

(*c*) Evidence of intra-uterine death. A child whose body bears marks of maceration—putrefactive changes induced by the

[1] *B. M. J.*, vol. i. 1888, p. 436; *Trans. Path. Soc.*, vol. xxxix., p. 427; *Trans. Coll. Phys. of Philadelp.*, vol. i.; Bland-Sutton, "Tumours, Innocent and Malignant," 1893; and *B. M. J.*, vol. i. 1902, p. 465.

body lying in the *liquor amnii*—would likely be born dead. But, then, one has to decide whether such appearances were produced within or without the mother's body, since all bodies to be examined are not found fresh, but, on the contrary, some are found advanced in decomposition.

Given, however, the body of a child which presents none of the foregoing appearances, how are we to decide as to whether or not it was born alive?

This is the question asked of the medical examiner in a criminal case, and it can only be answered from the signs found by post-mortem examination of the child's body.

FIG. 83.—Front View of Monster (Fig. 82), showing the relation of the heads to the body, and the deformity of the feet.

The evidence of live- or still-birth must be determined from careful examination of the following:—

I. Condition of the Lungs;
II. Changes in the Circulatory Organs and Channels;
III. Changes in the Digestive Tract;
IV. Changes in the Umbilicus.

We shall consider these in detail.

I. CONDITION OF THE LUNGS.—Some have thought to include as an evidence of live- or still-birth, the configuration of the chest. Daniel and Plocquet thought this would be a good test to prove live- or still-birth. If infants had been made after the pattern of an india-rubber toy out of a certain mould, doubtless this would have been an excellent test, since by measurement merely of the girth of the chest

one could have said whether or not it conformed in girth to that of the standard pattern in which inflation had not taken place; but in respect that infants vary so considerably in their size and in individual measurements, it is impossible to say of the body of a given child from measurement solely whether or not its lungs have been expanded, or to do so with any approximation to accuracy. And the same is true of any set of figures comprising a series of observed cases, for it may well happen that in one set of observations certain chest measurements of the average dead child may be greater than those of the average living child, solely because of the average size and weight of the two sets. Casper[1] gives Tables of measurements of the chests of 1065 bodies of children that were either born dead, or that died shortly after birth, and he shows from these that the average chest of the children born dead had actually a larger measurement in the transverse diameter than that of the average living child. This, of course, would not be so, provided we were able to state the measurements of the chest before as well as after the establishment of respiration in the case of the children who survived birth, and what the measurements would be after respiration in the case of those who were born dead. The error of the calculation arises from working without knowable factors, and with factors of unequal value. So long as children at birth do not agree in size, in fatness, or in muscular development, and so long as the chest measurements are regulated by the original osseous form of the thorax, the muscular condition of the chest muscles, and the amount of fat thereon, it may be taken for granted that the configuration of the chest cannot be looked upon as a sign of any value whatever in determining this question.

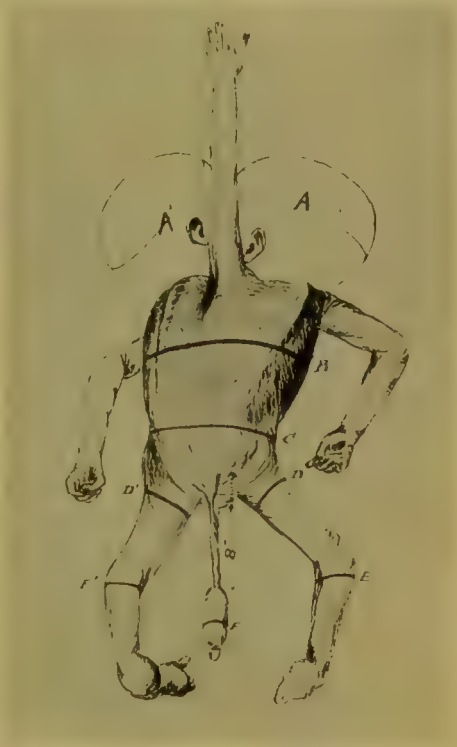

FIG. 84.—Diagrammatic Drawing of Monstrosity (Figs. 82, 83), giving measurements of parts. Back view.

A =	Circumference of Head			= 12¾	inches.
A′ =	,,	,,	,,	= 12¾	,,
B =	,,	,,	Thorax	= 15	,,
C =	,,	,,	Abdomen	= 12½	,,
D =	,,	,,	Thigh (right)	= 4	,,
D′ =	,,	,,	Thigh (left)	= 4	,,
E =	,,	,,	Leg (right)	= 4	,,
E′ =	,,	,,	Leg (left)	= 3	,,
F =	,,	,,	extremity of Caudal Appendage	= 2¾	,,
Total length of Caudal Appendage				= 8	,,

The hand which passes above the two heads possessed six digits, of which the first or thumb and the fourth were bifid.

In the same way, some have considered the position of the convex surface of the diaphragm with relation to the ribs as of diagnostic value. It is quite true—indeed, as a general fact it ought to be found—that the height of this structure relatively to the ribs is greater after a child has breathed than it was before. This is a

[1] *Op. cit.* vol. iii. pp. 42–47.

truth applicable, as a general principle, to all children; but when we come to institute comparisons between one child and another from this fact, our comparison at once breaks down from the point of view of accuracy since we are comparing two unknown things. Moreover, the height of the diaphragm in any one case, or in any set of cases, will depend mainly upon the degree of lung-inflation, which in itself is a variable condition in any series of cases of newly-born children. Further, if we can ascertain this height from dissection, we may safely neglect it, since the same dissection will reveal far more valuable and trustworthy phenomena.

II. Condition of the Lungs Themselves.—Whatever objections may be offered to the configuration of the chest as affording evidence

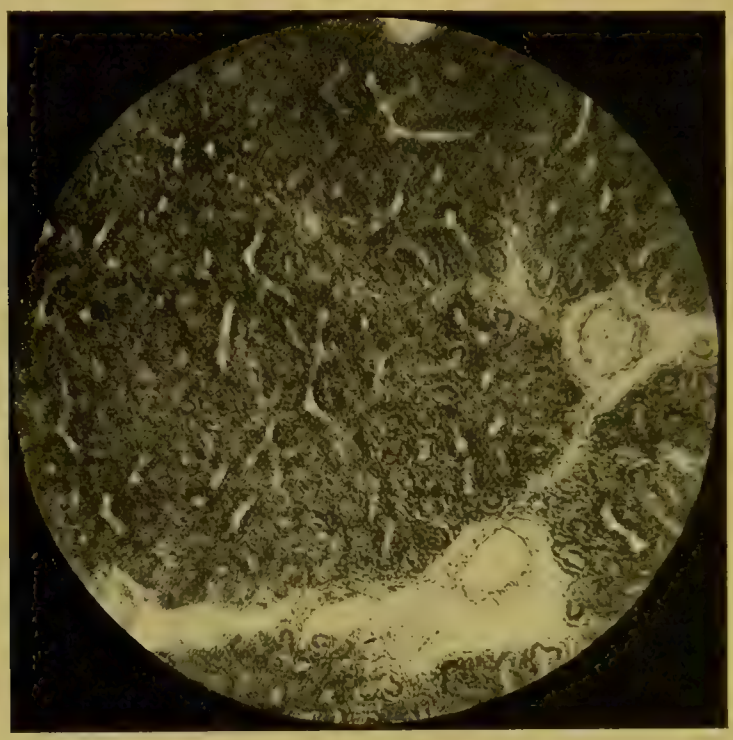

Fig. 85. — Photo-micrograph of Section of Lung-Tissue of still-born child showing unexpanded air-vesicles. × 50 diameters. (Author.)

of the live- or the still-birth of the child, such cannot be put forward to the facts found on examination of the organs of respiration, because they afford valid and satisfactory proof of the condition of the child with respect, at least, to the function of respiration. Prior to independent life, the lungs are absolutely useless in function; it is only when the living child is born that they become organs of function. (Fig. 85.) The course of the fœtal circulation is regulated to suit the former state. Whereas before birth the lungs only receive that amount of blood-supply which is necessary for their vitality and growth, after that event all the blood in circulation in the body of the child must pass through these organs to become re-aërated. In order that the process of aëration may be accomplished, the respiratory function

must be set in operation. Both changes, which happen contemporaneously at the birth of a living child, produce, therefore, physical changes in the lungs, with respect to (*a*) volume, (*b*) colour, and (*c*) weight.

(*a*) *Changes in the Volume of the Lungs.* — Before birth the lungs do not fill the area of the thoracic cavity, the left not even partially overlapping the pericardium. In texture, they resemble much in appearance and consistence those of adult liver; and the lobules are very indistinctly marked. After the establishment of respiration, they more or less completely fill the cavity of the thorax—the completeness depending upon the thoroughness of the respiratory action—the left lung now more or less covers the pericardium; and in the apex of the right the appearances of inflation are usually most marked, because the air enters this part of the lung structure with the least difficulty. Between these two conditions of non-inflation and complete inflation, there are intermediate stages of incomplete inflation, in which circumstances it is almost impossible to affirm from physical appearances alone whether or not air has entered the lungs, to make certain of which fact further procedure is requisite.

(*b*) *Colour of the Lungs.*—Prior to respiration, the lungs are of a uniform reddish-brown, or liver colour, but at the margins, because of the less thickness, they may appear more red on account of their greater translucency. Fœtal lungs present no patches of different colour. After respiration, the colour becomes marbled in general aspect; of a dark bluish-red ground colour with many bright red limited patches; or of bright-red ground colour with dark bluish-red circumscribed patches. This marbling in appearance and colour is absolutely characteristic of natural inflation. This cannot be simulated by any artificial method; if, for example, the fœtal lung be artificially inflated, the colour becomes of a uniform bright red.

(*c*) *Weight of the Lungs.*—Two tests have been based upon the weight of these organs; one on the ratio between the weight of the lungs and the total weight of the body of the fœtus, which is called the *Static test* or *Plocquet's test*, having been suggested by W. G. Plocquet in a publication in 1774; the other, on the ratio of the specific gravity of the organs to that of water, which is called the *Hydrostatic test* or Raygar's test, which was instituted by Raygar in 1682.

Of the static test it may be said, that the number of observations made by Plocquet from which he formulated the principle of the test, was three in all; and it seems that from such limited observations he tried to establish this rule: That in children who had respired the ratio of weight of the lungs to that of the body was in the proportion of 2 to 70, and that in those who had not breathed the ratio was 1 to 70. He then stated that when in any case the ratio of lung to body weight was as 1 to 70, the child had not respired, but where it was 2 to 70 that the child had breathed. This conclusion has many times been put to the test of practical experiment, and has always been found wanting. Dr. Cory[1] gives notes of the examination of the bodies of fifty-eight children who were either born dead, or who died shortly after birth, and he points out, in the cases of still-born children, that the average ratio of weight of lungs to that of body was 1 : 54·89; in

[1] "St. Thomas's Hospital Reports," vol. xxiv.

the cases where there had been imperfect respiration, 1 : 48·65; and in the cases where perfect respiration had taken place, as 1 : 41·5. It cannot, therefore, be affirmed that this test is of any significance, because of the variability of figures which its application reveals.

Very valuable and reliable information on the other hand is obtainable from the Hydrostatic test, which, as has been said, is based on the well-established fact that a lung which contains air is specifically lighter than water, and, therefore, will float. There are, however, those who deny that the flotation of the lung proves that it is alone due to contained atmospheric air, and, on the other hand, that if the lungs sink the existence of previous respiration is thereby disproved. Before discussing these points, however, let us consider the method of putting the test into practical application. It is performed as follows. Take any commodious vessel, such as a hand-basin—or if the examiner prefers to carry his own vessel, let it be one of about one foot in depth, and from eight to ten inches in diameter—and nearly fill full with water from the tap. Having detached from the body of the fœtus both the lungs and heart *en masse*, place them in the water in the vessel; note what happens. The mass may either sink completely, or it will float more or less completely although submerged in greater or lesser bulk. Let us assume that it floats, but that the mass is submerged; then remove the heart from the lungs and each lung from the other, and test the flotation of each lung separately; should each float perfectly, then wrap the lung in a piece of soft cloth, place the whole upon the floor, and stand upon the mass with the flat part of the sole of the boot; then test the flotation once more; if it still floats freely, then it may safely be affirmed that the child had respired freely. On the other hand, let it be assumed that the original mass of organs together sinks completely, then detach the heart and lungs, and test each lung separately. Let it be assumed that the right lung sinks in its entirety; then cut up the lung into pieces and test each piece separately, noting whether each piece sinks or floats; separate the pieces which have floated, apply pressure to each after the above-named fashion but with a correspondingly less severe pressure, and test flotation of the pressed pieces once more; if they still float, it will indicate that these pieces, at least, contain atmospheric air. Repeat the process with the left lung; and at the conclusion, note the number and situation of the pieces which have floated, and thereafter, pronounce an opinion as to whether the respiration has been imperfectly established or but weakly established. In cases of imperfect inflation, our experience is that the upper part of the right lung is likely to float when the major portion of the left, and the bases of both lungs sink. It is a good plan in such cases of imperfect respiration to take the specific gravity of the lungs before they are cut up into pieces. The operation is not difficult to perform, and the apparatus needed is neither bulky nor costly. A good pair of apothecary's scales with one pan attached to the beam by linked wire, and a glass jar of the dimensions named, are all that are required. It is necessary, also, that a counterpoise of exact weight be adjusted and attached to the scale-pan which enters the water, so that the balance will be exactly counterbalanced when the empty pan is placed in the

water of the jar. Such a counterpoise made of lead, or glass, can be bought and hooked on to the pan. The apparatus without the counterpoise is first used to weigh each lung *in air*, the weights in grammes being duly noted. Assume that the right lung weighs 25 grammes, and the left 21 grammes. Then proceed to weigh *in water*, by first attaching the counterpoise to the water-pan. Weigh the organs in the same order, taking care to note that the lung is wholly submerged in the water of the jar; note the weights. Calculate, as follows, the specific gravity of each lung:—

The right lung = 25 grammes in air
" " " = ·9 " in water
24·1

∴ 24·1 : 25 :: 1000 : x
∴ $x = 1{\cdot}037{\cdot}3$ = *specific gravity of right lung.*

Calculate the specific gravity of the left lung in the same way.

It is necessary to explain why the pressure above mentioned should be employed in such cases, if not indeed as a routine practice in all cases, which we prefer to do, on the ground that one would be prepared if questions are asked in the witness-box. The air which is taken into the lungs may be divided into *tidal* and *residual* air; the former may be expressed comparatively easily from the lungs, the latter only by destruction of the lung tissue itself. In the process of decomposition of the lung, putrefactive gases may develop and form underneath the pulmonary pleura, and this, if existent in quantity, might affect the flotation of the organ. But by exercising such pressure as has been indicated, these putrefactive gases are dispelled, and, therefore, as a factor in flotation, they are got rid of. Consequently, if after this procedure the lung float, we may confidently affirm that it contains atmospheric air. The general conclusions which may be drawn from this test are these: If one or both lungs, or if even portions of them float after pressure has been duly exercised upon them, the child has breathed perfectly, or imperfectly; and if both, and all the portions of both lungs sink, that the child has not breathed at all.

To these conclusions it has been objected that a lung may float from other causes than respiration and atmospheric air contents, as for example, from—

(*a*) Artificial inflation.
(*b*) Spontaneous development of interstitial, or vesicular emphysema.
(*c*) Putrefaction.

And that a lung may sink, although respiration has been imperfectly established, from such causes as the following:—

(*a*) Disease.
(*b*) Atelectasis.

These objections must receive some detailed consideration:—

(I.) *With respect that a lung may float from artificial inflation.*—The first point to be noted is that artificial lung inflation is extremely difficult of accomplishment even at the hands of a skilled person, and practically impossible by an ignorant person; if it were not so, it would be more generally utilised as a means of resuscitating the semi-asphyxiated new-born. Elsässer declares that of 45 attempts to perform this operation, only one was completely successful. But this one

successful case demonstrates its possible accomplishment, and, therefore, we must seek to discover appearances in the lungs which will differentiate between artificial and natural inflation. The following points will usually indicate the differences:—

(*a*) Artificially-inflated lungs exhibit a uniformly distributed bright-red colour, whereas naturally-inflated lungs present a mottled or marbled coloration, as before described.

(*b*) If section be made of the former, the surface will present a dry appearance, whereas from that of the latter, bloody, frothy fluid will be seen escaping. This is due to the fact that when a child takes its first breath it not only takes air into its lungs, but the course of the fœtal circulation is then diverted into the lungs, thus accounting for the foregoing appearances. Without the normal function of breathing, there will be no more blood in the organ than that which existed during the fœtal condition, in which state the lung still remains, except for the artificially-inflated air. If artificial inflation has been successful, it is apt to be overdone; hence rupture of some of the superficial air-vesicles is likely to be seen by the naked eye, or by a hand-lens, on the free margins of the lungs.

(*c*) When artificial inflation has been attempted by the ordinary method of blowing into the mouth or nostrils, or by blowing through a tube introduced into the mouth, the stomach and intestines are apt to become abnormally filled with air, a condition which is only commonly found after putrefaction of the body has far advanced.

But a practical point suggests itself here. Where a mother, or any one else present at her confinement, attempted to perform this operation, no charge of concealment of pregnancy would lie, for the very attempt to resuscitate the child in this manner negatives a desire to destroy it; further, to a mother whose sole object is to prevent her offspring from living, such an operation would be the last thing she would try to do.

It is to be borne in mind that, contrary to what has sometimes been asserted, the same difficulty is experienced in expressing the air out of lungs which have been artificially inflated, as out of those naturally inflated.

(II.) *Emphysema pulmonum neonatorum.*—This is an alleged possible condition of the lungs of the newly-born, which, however, has not been clearly demonstrated. It is not easily conceivable that in an organ which has never been used such pathological changes as emphysema could possibly occur; and it is difficult to comprehend how the condition could develop in the lungs before birth. It appears to us that in those cases in which it was supposed to be present, there must have been entrance of air *per vaginam* to the child, the effect of which would be to stimulate the respiratory function of the child when it was in such a position that the respiratory movements were hampered, and forced inspiratory action induced, which might account for the emphysematous appearances found. The only other condition for which it may have been mistaken is the development of putrefactive gases in the lung tissues.

From time to time observers have recorded instances not only of intra-uterine respiration, but under certain circumstances, also of intra-uterine crying.

A correspondent of the *British Medical Journal* writes of a case[1] in which, having resolved to induce labour at the eighth month owing to previous difficulty of delivery at full time, he introduced a female catheter, by which the amniotic membranes were opened high up in the uterus and about a quart of fluid escaped. "After a few minutes," he adds, "the cries of the fœtus were audible to all in the room. Air had entered the uterus through the catheter on cessation of the flow of water." Labour set in about thirty hours after, and a male child was delivered by forceps, alive. A still more remarkable case is described by Planchu and Reure[2] in which the latter observer heard loud crying of the child *in utero* for more than an hour, on the ninth day before delivery. It appears that the mother had complained of a watery discharge, and as labour was slow in coming on, vaginal douches of hot water were used by means of a pear-shaped syringe which, it was proved later, ejected much air with the water. Reure was called to the case because of the crying of the fœtus "which was so loud on his arrival that he expected to find the child born." The crying lasted continuously for about two and a half hours. Daily, between that day and the delivery, the fœtal heart sounds were heard and counted—on the average, the beats were 135 per minute. The child was born alive breech first but much asphyxiated, and died because of the greater need of attention by the mother who was bleeding.

The only comment to be made on these cases is this: that it must either be supposed that the supply of air which caused the child first to breathe was kept up till its birth, else the child would have been born dead by asphyxia, or that the physiology of respiration of the fœtus *in utero*, under the foregoing circumstances, must be different from that after its birth, which is inconceivable.

(III.) *Putrefaction.*—That the gaseous products of decomposition in the lungs may assist in causing them to float, there cannot, we believe, be the least doubt. But there must be substantial evidence of such putrefaction, coupled with a non-inflated state of the lungs, before this view can be entertained in an individual case. It would be absurd to expect that such products would be present in lungs to such an amount as would of themselves cause flotation, where the rest of the body bore no evident marks of putrefaction. Besides, in a child's body the lungs are among the last organs to undergo putrefaction, and, therefore, marked evidence of putrefaction of the body generally would require to be present to permit of these gaseous products being deemed an important factor in the flotation. When lungs and body generally are far advanced in decomposition, it becomes impossible for the examiner to determine whether flotation, if it take place, is due to the presence of atmospheric air, or of putrefactive gases, or of both combined. He should therefore frankly admit his inability to affirm that the child had breathed. This much can be safely said: that if a putrefying lung sink in water, it is good evidence that the child has never breathed, or has but imperfectly respired.

On the other hand, it is affirmed that a child may have breathed, and may have lived for some hours, without any response to the test flotation of lungs after trial. Such cases have, from time to time, been recorded. Among the most recent are the following:—[3]

In the first it is stated that an inquest was held on the body of an illegitimate female child, which was exhumed after being buried ten days. The evidence at

[1] Vol. i. 1901, p. 256.
[2] *Lyon Méd.*, January 6, 1901: *B. M. J.*, vol. i. 1901, Supp. p. 14.
[3] *B. M. J.*, vol. ii. 1900, p. 1567; and vol. i. 1901, p. 146.

the inquest was to the effect that the child had been born precipitately, that the mother was first attended by a neighbour, then by a medical man, and last of all by the parish nurse, all of whom saw the child alive, though weakly. The child lived about five hours after its birth. The post-mortem examination showed that the child was at full term, and was fairly well developed. The lungs were found collapsed, not filling the chest cavity, and in a condition of complete atelectasis. On using the hydrostatic test, the lungs when tried together, separately, or in portions, sank, and presented the appearances and results of those of a still-born child. The medical man who made the dissection stated at the inquest, that had he not heard the evidence of five different persons on oath that the child lived five hours, he should have been compelled to swear that the child had been still-born and had never breathed. He offered the explanation that the child had lived the number of hours it did by whatever aëration the blood received through the mucous membrane of the trachea and larger bronchi. The second case was that of the child of a married woman which was born at seven months. It was washed and dressed, and although it never cried, it "made a moaning noise." It lived about seven hours. An inquest was held, and a necropsy performed. The medical evidence of the necropsy bore that the lungs were collapsed, and that no developed air cells, or vermilion spots, could be seen. The lungs as a whole sank in water, and although they were cut into small pieces, every piece sank to the bottom of the vessel. There could be no doubt whatever of the child being alive, although feebly, for seven hours, and the performance of the hydrostatic test showed not the least response to flotation of even isolated small portions of lung.

It must be frankly acknowledged that these are difficult facts to face, especially by any one who pins his faith to the absolute veracity and impartiality of the hydrostatic test, for we start from the well-established fact in both cases that different competent witnesses swore that the child lived for hours. From the physiology of respiration, it would *primâ facie* be held impossible for children to live and breathe, however imperfectly, for five and seven hours respectively without some evidence of establishment of the respiratory function being left in the lungs. It would be interesting to inquire why it was deemed necessary by the Coroner in each case to hold an inquest, when reliable witnesses swore to the live-birth of the child and its weakly condition in each case, and hence the cause of death could easily be accounted for. Were there suspicious circumstances in each case calling for an inquest and a post-mortem examination, and for what reasons were the medical attendants unable to sign certificates of the causes of death? We do not suggest the following possibility in the cases narrated, but it is not inconceivable that in such cases submersion of the child in water might account for the absence of flotation. Moreover, one would like to know more about the appearances of the lung section in the latter case, and of the condition of the body relative to putrefaction in the former, before a definite judgment was formed. We have never chanced to meet such a case as the foregoing.

III. Lungs may sink from Disease, such as Pneumonia.—While this is undoubtedly true of the hepatic stage of that disease, it presupposes the previous establishment of respiration; and in connection with the question of infanticide or concealment of pregnancy, the statement would only be relevant if it could be shown that the child was born suffering from pneumonia, of which no undoubted case has yet been published, so far as we know.

The same observations apply to pulmonary tuberculosis, since

congenital disease of the lungs of such an extent as to prevent flotation after respiration, is unknown. The same is also true of syphilis; for while such lesions have been found congenital, they are not extensive in the lungs. Asphyxiated lungs may float or sink, depending upon the asphyxiating cause. If the cause be drowning, they are not likely to float. The diagnosis in such a case would be cleared up, however, by other and additional signs, such as petechial ecchymoses on pleuræ, pericardium, or diaphragm.

Assuming that the child has survived its birth, but has some days afterwards been put to death, attention must be given to the following conditions, as indicative of the period it has lived, viz. :—

(*a*) The condition of the umbilical cord;
(*b*) The state of the stomach and intestines;
(*c*) The changes in the heart and circulatory system.

(*a*) The changes which occur in the umbilical cord are of great moment in determining this question. The first signs of separation of the cord may be apparent from 36 to 48 hours after birth, and consist of an inflammatory line at the point of junction of cord with the abdomen. The line of separation becomes deeper daily till the 5th, 6th, 8th, or even the 9th day, when the separation becomes complete. Probably in the largest number of cases, the separation is accomplished on the 6th day, in the next largest, on the 5th, while in graded smaller proportions of cases, on the 7th, 8th, and 9th day respectively. On the average, therefore, the cord may be looked upon as separated by the 5th or 6th day after birth. Lowndes gives a case in which the body of a newly-born male child was found in a cellar with a scarf tied tightly round the neck. The lungs indicated that the child had respired. The umbilical cord for about half an inch from the navel was perfectly fresh, and its remainder, $2\frac{1}{2}$ inches in length, was completely mummified. There was no ligature. From these appearances, he was of opinion that the child had survived its birth at least 24 hours.[1]

(*b*) The changes chiefly to be looked for in the stomach and intestines are the presence or absence of food, and if present, its character, and the presence or absence of meconium in the small intestine. The presence of food, such as partly digested milk, would point to the fact that the child had survived its birth, although its absence would not point to the opposite conclusion. With regard to meconium in the bowel, its absence does not necessarily indicate that the child has survived its birth, since in breech presentations, which, in the absence of skilled assistance, are perilous to the life of the child, the meconium may be voided, partly as the result of abdominal compression, and partly from asphyxia induced by pressure on the cord.

(*c*) The changes in the heart and circulatory system ought to receive attention, although not much practical benefit may accrue from the examination because of the comparative variations of time when the fœtal structures close. All these structures—the *foramen ovale*, *ductus arteriosus*, *ductus venosus*, and umbilical vessels—become functionless, in ordinary cases, sooner or later after birth, but they are all pervious in the newly-born child. The *foramen ovale*, for example, does not become permanently closed till the second or third month; the *ductus*

[1] *Liv. Med.-Chir. Jour.*, July 1889.

arteriosus, however, begins to shrink within three or four days, but is pervious to a fine instrument at the end of two months; the same may be reckoned of the *ductus venosus*. The umbilical vessels are the first to become obliterated. They begin to contract about 10 hours after birth, and are completely impervious within a week after.

Certain other tests of live-birth have been suggested by observers. Of these, the following may be mentioned, although no practical value may be attached to them.

1. *The Deposits of Uric Acid in the Kidney.*—These brownish streaks of uric acid in the ducts of Bellini are only to be found, say some, in children born alive and who have lived for not less than 48 hours. It is equally asserted that they are not found in children born dead, that their causation is not pathological but physiological, and further, that the phase of their existence is most marked between 48 and 216 hours after live-birth.[1]

2. *The Relation of the Weight of the Lungs to that of the Liver, which is called Bernt's test.*—This test may be held to be practically valueless.

3. *The Presence or Absence of Air in the Middle Ear.*—During the fœtal state, the middle ear is filled by embryonic connective-tissue, which becomes replaced by air at a shorter or longer interval after the institution of respiration. If, therefore, the middle ear be found to contain air instead of this tissue, say Wreden, Werdt, and F. Ogston, it is a proof of live-birth; and if it contain a fluid corresponding in appearance to that in which attempts at breathing have been made, it is proof positive of respiration. The chief drawback to the applicability of the test in practice—and to our mind it is a fatal one—is that the time of disappearance of this embryonic tissue varies from a few hours to two or three weeks.

The following conditions summarised when found on the body of a newly-born child, would warrant an examiner in affirming that the child had breathed:—

(1) When the child is sufficiently mature to be able to live an independent existence. Maturity may be held established if centres of ossification are found in the epiphysis of the lower end of the femur, and in the tarsal cuboid bone.
(2) When the lungs more or less completely fill the thoracic cavity.
(3) When the colour of the lungs is marbled, or mottled.
(4) When the lungs, or portions of them, after being duly tested, float in water.
(5) When a bloody, frothy fluid exudes from the lung section on slight pressure.

IV. If the child was born alive, what caused its death?—A child may be born alive in a weakly condition and may only survive its birth a few minutes or hours from what is termed, for want of knowledge of the more intimate cause, Birth Debility. Under this designation are comprehended various causes, such as congenital debility, effects of difficult parturition causing organic lesions of brain or skull, imperfect establishment of respiration, and some others. On

[1] Cory, *op. cit.*

the other hand, children may be put to death by violence in a variety of ways, or may meet with death accidentally by violence, or from other causes. But the medical examiner may have to conduct examinations on the bodies of newly-born still-born infants, which have been thrown into a waste-heap or other like place by parents who are either too careless or too poor to bury them, as well as the bodies of those who have been born alive, but who have died shortly after and have been disposed in a like manner, in addition to those which bear the marks of violence. It has been our duty to examine for medico-legal purposes about 40 bodies of newly-born children which have been found by the police exposed in public places, of which 9 only had not attained a viable age. One point must be enforced at this stage—That the fact of exposure of the dead body of a fœtus does not necessarily indicate either that it has been born alive, or that it has met with a violent death.

In the examination of a body, therefore, to ascertain the cause of death, the examiner has to consider not only the cause but the manner in which death has been brought about. For example, while the cause of death found may be asphyxia, the mode of producing the asphyxia may arise from the accidents of child-birth and where there has neither been concealment during pregnancy nor at birth; or from intentionally applied violence, in which case the crime of child-murder has been committed. It will therefore be necessary to consider the causes from which the child may be still-born, as well as the causes by which the child has been prevented from living at, or after its birth. A child may be born dead from causes such as the following:—

(*a*) Injuries received while *in utero*.
(*b*) Accidents in child-birth.
(*c*) Congenital disease.
(*d*) Immaturity.

I. *From Injuries received by the Child in utero.*—These injuries may have been produced intentionally or accidentally. Fractures of the cranial vault, rupture of blood-vessels in the brain, rupture of internal organs, and fractures of the extremities have resulted from the external application of violence to the abdomen of the mother.[1] We had in our possession, taken from the body of a child born dead, fractures of both radius and ulna, the history of the case being that the mother had sustained a fall some time before its birth. Burdach[2] narrates the case of a woman who, in the sixth month of her pregnancy, received an injury to her abdomen sufficient to fracture the forearm and leg of the child, who, although carried by the mother to full time, showed at birth the fractures united at an angle. As to fractures of the cranium inflicted *in utero* some healthy doubt may at first be entertained. In usual circumstances, it is difficult to comprehend how they may be produced, because of the protecting influence of the *liquor amnii*, and the situation of the head *in utero* in cranial presentations. But this doubt must not be carried the length of absolute incredulity, since it ought to be remembered that in breech presentations the head

[1] Casper, *op. cit.* vol. iii. p. 110.
[2] Leishman's "Midwifery," 2nd Edit. p. 419.

is in the upper segment of the uterus, and thus is exposed to violence Moreover, cases have been recorded in which extensive cranial injuries have been so produced. Two such cases are quoted by Casper.[1]

One by Blot, in which a primiparous woman during labour and before the rupture of the membranes, accidentally fell from two stories in height into a courtyard, whereby she had her femur fractured, besides receiving many severe contusions. The child by this time had passed through the *os uteri*, much crepitation was felt on its head, and it was delivered dead by the aid of forceps. On dissection of the head, a fracture of each parietal bone was found, and much bruising of the scalp. Maschka records the second.[2] It was that of a woman who, towards the eighth month of her pregnancy, precipitated herself to the ground from a height of two stories and fractured both thighs, of which injuries she died. On the head of the fœtus *in utero* several fractures of both parietal bones, and much bruising of both scalp and brain were found.

On the other hand, a pregnant woman may herself receive severe injuries without any injury being sustained by the fœtus. Dr. Pagan of Glasgow used to relate the case of a woman who, eight months pregnant, was accidentally run over by his carriage and severely injured, but whose child was unhurt.

While the foregoing cases are out of the category of infanticide associated with concealment of pregnancy or of birth, they show that such injuries might be inflicted upon the fœtus *in utero* as to cause intra-uterine death.

II. *From Accidents during the Delivery of the Mother.*—It is in this class of cases that the most careful scrutiny of the facts is demanded, since, most usually where a defence is offered, death of the fœtus by accident at birth is pleaded. It is true that a fœtus may die during the process of child-birth from a variety of causes. Some, although living up to the time of birth, succumb from debility during the process; others die from the effects of tedious labour, or from want of skilled assistance owing to mal-presentations, such as funis and breech presentations, or from such a complication as coiling of the umbilical cord round the neck; others, again, due to maternal pelvic deformity, or a normally tight pelvis, may suffer from fracture of the cranium, or intra-cranial effusion of blood. In all of these cases careless or poor people may simply throw away the body of the fœtus to save themselves the expense of proper burial.

A fœtus may die also from accidental causes at the moment of delivery; (*a*) from suffocation in the dress of the mother, or in the bedclothes, or in the discharges which usually accompany delivery; (*b*) from being projected from the maternal parts into a vessel containing water, such as a *pot-de-chambre*, a chair-stool, a water-closet, a tub, or other capacious vessel for holding slops. This may happen from the fact that, just before the birth, the pressure of the head on the rectum and bladder creates a strong desire on the part of the woman for evacuation of the contents of these organs, which if acted upon, may, by the occurrence of a strong pain, cause the child to be projected into the vessel, and its death by drowning. We have met with two *bonâ fide* cases in our experience; one in which a young woman, in labour with her first child, was delivered of her child into a *pot-de-chambre* which contained a quantity of urine. She shouted for assistance to her neighbour, but who, power-

[1] *Op. cit.* vol. iii. p. 114.
[2] Prager's *Vierteljahrschrift*, 1856, Bd. iii. sec. 105.

less to help, rushed out of the house for assistance, and on our arrival, we found the child—a small one—head-downwards in the position described; in the other, a married woman, in labour with her third child, went out to a water-closet on the stair-landing of a tenement flat, and when there was seized with violent pains, and was delivered of her child in the closet-pan. She shouted for help, and the child was rescued, and with great difficulty was resuscitated. In a third case which happened in the experience of a colleague, a woman while in labour, was straddling over a small slop-tub because of her urine being forced from her by the pains, and while in that position was delivered of her child which fell into the water and was drowned before assistance arrived. In precipitate labour, a child may be projected with such force from the mother's body to the ground that cranial injuries, sufficient to cause death, may be produced. Casper, Swayne, Landsberg, and other writers have recorded cases of this kind, in which the event happened before eye-witnesses. To test the possibility of this, Chaussier conducted a series of experiments, with the result that of the bodies of 25 new-born children dropped from a height of 30 inches from the ground—the average height of the female genitals from the ground in the standing posture—fractures of the cranium were produced in 24, and of these 22 had sustained fractures of either one or both temporal bones. It may, therefore, be taken as a well-established fact that such fatal injuries may be produced in the manner indicated.

Cases, however, may occur without precipitancy of labour in which cranial fractures may be produced. Mace records a case in which a woman of 25, a tri-para, awoke in the middle of the night without pains. During the act of micturition the fœtal head appeared at the vulva and was soon born, but with one of the parietal bones fractured, although there had been no interference, no rupture of cord, and the child did not fall to the ground.[1] Probably one of the most difficult cases to decide as between strangulation by natural causes and by applied violence, arises where a mark is found upon the child's neck. Every experienced obstetrician knows that coiling of the umbilical cord round the neck of the child is by no means uncommon. It is not difficult, therefore, to conceive a case in which a woman may be suspected improperly as the murderer of her child, when after all it has been strangulated by the cord during birth. We have examined two cases at least in which this was the apparent cause. The mark produced by the umbilical cord on the neck is never well marked, and the death is not so much due to the constriction exercised, as to asphyxia induced by interference with the placental circulation through the cord.

III. *From Congenital Disease.*—Syphilis is the usual cause of death of the fœtus, and the death may not occur till nearly the end of the term of pregnancy in cases where a woman has had a succession of still-births from this cause at varyingly earlier periods. Of the lung conditions atelectasis is probably the most common. Abnormal cardiac formations also cause death either during delivery, or almost immediately after.

IV. *From Immaturity.*—As has been already remarked, a fœtus

[1] *L'Obstét.*, vol. vi. p. 54, Jan. 1901. *Vide* also Cory, *op. cit.* p. 4.

under the intra-uterine age of seven months will not live under ordinary circumstances. Proofs of the immaturity are best obtained by examining for the centre of ossification of the lower epiphysis of the femur. This appears at the end of the ninth lunar month of intra-uterine existence, and becomes well marked by the end of the tenth. For all practical purposes of the determination of viability, it is sufficient to examine for this. But if greater accuracy is desired, then the tarsal cuboid bone should be examined, since the ossific centre in that bone appears at the tenth lunar month. At maturity, the ossific

I. II. III.

FIG. 86.—States of Ossification of Humeral and Femoral Epiphyses and Posterior Tarsal Bones. From above downwards, the order is as follows, viz.: (1) Epiphysis of Humerus; (2) Epiphysis of Femur, upper and lower; (4) Tibial Epiphysis; (5) Astragalus; (6) Os calcis. Series I., Ossification in these bones in Eighth-Month premature Female Child; Series II., in full-term Female Child; and Series III., in 3½-months' old Child. (From Hofmann's "Atlas of Legal Medicine," by permission of the publishers.)

FIG. 87.—Section of Lower Limb and of Humerus of Mature, Newly-Born Child. Points to be noticed: (1) absence of osseous nucleus in upper epiphysis of femur; (2) presence of nucleus in lower epiphysis; (3) nucleus in head of tibia; (4) nuclei in astragalus, os calcis, and cuboid tarsal bones. It is exceptional to find a centre in upper humeral epiphysis at mature birth, but it is present sometimes in robust infants. At the seventh month, the nucleus in os calcis is the size of a pea. (From Hofmann's "Atlas," by permission of publishers.)

centre of the lower femoral epiphysis is about the size of a small pea, and measures about 5 millimetres in diameter. While it is advisable that the height and weight of the fœtus should be taken, it is better to rely upon the presence or absence of the femoral osseous nucleus as evidence of maturity, since small children as well as large may be born mature. To determine whether or not the fœtus was viable, examination of the *os calcis* should be made, for an osseous centre about the size of a pea is most usually found between the 28th and 30th week of fœtal development. To examine for the femoral osseous centre, the

easiest method is to forcibly flex the knee, cut down through the epiphyseal cartilage of the femur, and then to cut thin sections so as to expose, if present, the little nodule of bone. The other centres are not so easily cut down upon, but ordinary anatomical knowledge will indicate ways.

It now becomes necessary to consider the bodies of fœtuses which have been found bearing marks of violence upon them. Having discussed the conditions under which such marks may arise from accident, we must now turn our attention to injuries which may have been inflicted homicidally, and which constitute the crime of infanticide.

The most distinguishing characteristic of homicidally inflicted violence, speaking generally, is its brutality; that is to say, the violence has been overdone. This is not true of all cases, but it is true of the bulk of them. It is by no means uncommon, for example, to find cases of which the following, recorded by the late Professor Ogston,[1] may be taken as a type.

"Besides fracture of the parietal and frontal bones of the cranium, the sides of the head and face were flattened, and impressions of large shoe-nails were visible on one cheek." In this case, the woman had been delivered secretly in a cow-house, and the marks on the child's face corresponded to the nails in her shoes; and it was not difficult to arrive at the opinion that she had trampled and stamped upon it with her feet.

In another case, fractures of the cranium, lower jaw, left arm, and both legs were found, and the tongue was torn out. At a Circuit Court held in the Northern Counties of Scotland a few years ago, a hotel-servant was convicted of concealment of pregnancy. The body of her child had its neck lacerated, and its lower jaw fractured. In a case which we recently examined, extensive fracture of the skull was found, with laceration of brain and extravasation of blood upon the surface and into the substance of the brain. Occasionally, however, injuries are found which are not of the ordinary character. We examined the body of a female fœtus, of which the left forearm was awanting from the elbow-joint, and on the left side of which was a large wound the size of an ordinary saucer, both of which were evidently of post-mortem production. The body was found in the river Clyde. It was evident from the presence of a large *caput succedaneum* that the child had been born after a difficult labour, but the lungs responded perfectly to the hydrostatic test, and they completely filled the chest cavity. The examiner, in every case, should carefully examine the head over the fontanelles for punctured wounds, as these are most vulnerable parts which may be easily penetrated by a long, sharp instrument, such as a large needle, without leaving much mark behind. In short, the presence of injuries on the body of a new-born child ought at once to raise the suspicion of intentional violence.

A fœtus may bear the marks of gun-shot wounds, where the projectile has penetrated the abdominal wall and uterus of the mother.

In one case recorded by Rubetz,[2] three wounds were found on the body of the fœtus. One of the bullets had entered to the left of the spine of the first lumbar vertebra, wounded the intestines, the diaphragm, left lung, and heart, and made its exit from the body near the left nipple, then entered the brain of the fœtus near the left ear, where it was found. The mother died from septicæmia, probably due, it was stated, to a fragment of clothing having been driven into her body by the bullet.

Another form of infantile death is Homicidal Suffocation. This may be produced by strangulation with a ligature, by drowning, or by impaction of foreign bodies forcibly inserted into the mouth and air-pass-

[1] *Op. cit.* p. 259. [2] *B. M. J.*, vol. ii. Nov. 12, 1899.

ages. In many cases it is impossible to determine the cause of the asphyxia, although this proximate form of death has been clearly demonstrated by the internal post-mortem appearances, or whether it has been produced accidentally or homicidally. Where a ligature is found tightly encircling the neck, and internal signs of asphyxia are present, it is not difficult to form an opinion. In all such cases the nature of the ligature should be noted, the ligature itself preserved, and the mark upon the neck carefully dissected for evidences of extravasation. The appearances of the lungs, the froth in the air-passages, and the watery, dark, bloody exudation on lung-section, would point to drowning. The presence of foreign bodies in the mouth and air-passages when accompanied by the internal signs of asphyxia indubitably point to homicidal suffocation.

In one case, tried before the Perth Circuit a few years ago, a woman was convicted of culpable homicide for having suffocated her newly-born child by stuffing pieces of paper into its mouth, with the object presumably of stifling its cries. In another case, where the body of a male child was found in the Clyde in a box loaded with pieces of iron to cause it to sink, the post-mortem examination indicated that it had been strangled. The method of disposing of the body also indicated secrecy.

Strangulation may also be effected by compression of the throat with the fingers. In such cases the plea of attempting self-delivery is sometimes set up.

The presence of marks of constriction on the neck, accompanied by bruising, coupled with the fact that the lungs are found well inflated, can only point in the direction of homicidal strangulation.

A domestic servant in Somerset during the absence of her mistress was delivered of a child, the body of which was afterwards discovered rolled in a calico skirt between the bed and the sacking. The neck presented appearances of constriction, there being a narrow mark, irregular both in width and depth, but accompanied with little bruising. The medical man who was called to see the body thought the compression mark due to the umbilical cord, but the lungs were fully inflated, filled the cavity of the chest, and together with the heart, floated in water, showing that the child must have breathed freely—probably cried—after its birth. The coroner's jury returned a verdict of infanticide. She was convicted of the charge of concealment of birth. At the Essex Winter Assizes, a midwife was charged with the crime of wilful murder of a newly-born male child. A witness testified that as soon as the child was born, the accused used a napkin with violence on the child's face, and that, later, she saw a piece of garter tied round its neck. Medical evidence showed that there were three depressed marks on the neck, apparently caused by a cord, that the child had respired, and that it had died of suffocation.[1]

The common defence in a charge of infanticide in cases where fracture of the skull is found is the plea of precipitate labour. The value or relevancy of this plea may be established by the medical evidence obtainable by an examination of both the mother and the child. The points to be attended to in the examination of the former are the following:—

(*a*) Whether the woman is a primipara or multipara;
(*b*) If the pelvic parts of the woman be roomy;
(*c*) Whether or not there is laceration of perinæum.

[1] *B. M. J.*, vol. i. 1901, p. 432.

And in the examination of the latter—

(*a*) Whether or not the umbilical cord be ruptured;

(*b*) Whether or not the placenta and fœtus are still united by the cord;

(*c*) The character of the cranial lesions;

(*d*) The presence or absence of *caput succedaneum;*

(*e*) The size and development of the fœtus relative to the pelvis of the mother;

(*f*) The condition of ossification of the fœtal cranium;

(*g*) The presence or absence of other marks of violence upon the body.

Careful consideration and review of the facts will enable the examiner to test the plea offered by the logic of the facts.

Again, a child may die from omission to ligature the umbilical cord after cutting and before the circulation in it has ceased. This would be a typical case of infanticide by omission. The appearance of the severance of the cord with a sharp instrument, the absence of a ligature, and the comparatively bloodless condition of the body, are indications which would point in this direction.

Newly-born children may be killed by poisoning. Such cases are rare, for the simple fact that a woman who desires to rid herself of her newly-born offspring usually adopts the quickest and readiest means of preventing it crying, and thus announcing its arrival into the world; and so she either strangles it or uses such other mode of violence as first suggests itself to her.

Assuming, however, that in any of the foregoing cases in which marks of violence have been found, and which unmistakably are the cause of death, and that along with these, on dissection of the body, the medical examiner finds unequivocal evidence of complete respiration, under what circumstances would he be justified in affirming that the child was live-born in the legal sense of that term, at the time of infliction of the injuries? It is just at this point that criminal charges of child-murder break down, and the prosecutor is compelled to accept a plea, or a verdict, of concealment of birth, or concealment of pregnancy. We must, therefore, review the reasons for this.

In June 1893, a Return of Still-births in England and other countries was printed for the House of Commons. The object of the Return was to discover the practice of other countries regarding the registration of still-births, but in the schedule of questions sent out for answers, one was as follows: "What are the penalties for criminally causing a child to be still-born?" The answer for England is somewhat startling. "For procuring abortion the punishment is penal servitude for life, or for any less term of imprisonment. Where there is no procuring of abortion, *the killing of a child in the act of birth and before it is fully born is not an offence by the present law*, although if injuries are inflicted before birth which cause the child's death after birth, the law of murder applies." The reply for Scotland was: "Criminally causing a child to be still-born falls under the crime of 'procuring abortion,' the punishment for which, on conviction, is arbitrary;" and, for Ireland: "It is difficult to conceive any act or attempt made to procure the birth of a child still-born which would not be punishable

as the procuring of abortion, or attempting to procure it, under 24 & 25 Vict. c. 100, sections 58 and 59, and 27 & 28 Victoria, c. 67, section 2, with penal servitude for life, or not less than five years, or imprisonment with hard labour for any time not exceeding two years."

It would appear that the answers for the two last-named parts of the kingdom miss the precise point of the query, in respect that a child may be caused to be still-born during the natural process of labour at the full time without any unnatural means whatsoever having been used to bring on the labour, and that it may be done to death during the natural act of birth. It is this destruction of the child during the parturient process which does not constitute an offence against the law—that is to say, that if the parturient mother, or any other person, lay violent hands upon the child as it is being born and before complete delivery from the maternal parts is effected, they are not chargeable with any offence against the law.[1] As has been already stated, the legal definition of "live-birth" is not statutory, but judge-made, and is as follows: A child is live-born in whom independent existence has been established by the action of its own organs after complete delivery. Many cases may be cited to illustrate this.

On one occasion at the Norfolk Spring Assizes, Mr. Justice Coleridge laid it down as law that before the prisoner could be convicted of having murdered her child, the prosecutor must prove that the body of the child was delivered from the body of its mother before the violence was inflicted which caused the child's death. Mr. Baron Parke, in another case, stated that the law requires that the child should be born alive, and that the whole body of the child should have come from the body of the parent. These words were addressed to the Grand Jury, to whom he further said: If it should appear that death was caused during delivery, then you will not find a true bill. Mr. Justice Erle, in 1845, in a case, in which the head of the child was nearly severed from the body, told the jury that before they could find the prisoner guilty, they must be clear in their minds that the child had a separate and independent existence; that it must, in short, have been wholly born before the violence to it was inflicted; and that the child might have breathed during the act of birth, and, therefore, although it was a live child in the medical sense, it was not in the legal sense.[2] So recently as March 1901, Mr. Justice Wright, in the case of R. *v.* Pritchard for alleged infanticide tried at the Shrewsbury Assizes, said regarding live-birth, "That the true test of separate existence in the theory of the law (whatever it might be in medical science) is the answer to the question whether the child is carrying on its being without the help of the mother's circulation."[3]

This last legal pronouncement levels up the difference in definition between the law and medicine, inasmuch as it is well known that a child may not only breathe before complete birth, but cry audibly before its body is completely born from the mother's parts, and that it can only do this by virtue of the independent exercise of its own organs, and quite apart from the aid of the circulation of the mother. If this last decision could be accepted as the uniform expression of the law by judges, the medical profession would be content to accept it as being not only in accordance with physiological fact, but as tending to repress the crime of child-murder which has, in many cases, gone unpunished because of other interpretations of the law by other judges.

[1] *Vide* paper by the author, *Edin. Med. Jour.*, July 1895.
[2] Ryan's "Infanticide," pp. 7, 8.
[3] *Times*, March 5, 1901; *B. M. J.*, vol. i. 1901, p. 684.

With these facts in mind, we return to the answer to the question: Under what circumstances could a medical witness with reason affirm that a child upon whose body are marks of violence was live-born in the legal sense? We are of opinion that he could do so:—

1. When the lungs of the fœtus have been found fully inflated, and filling the thoracic cavity;
2. When the violence found upon the body is so distributed, or is of such a character, that full delivery of the fœtus is indicated.

And in the case of children, who have been allowed to live for days at least after birth, and have been put to death;

1. By changes in the umbilical cord;
2. By the presence of food in the stomach.

It is very rare, indeed, that a charge of concealment of pregnancy, or of birth, is by itself preferred against a woman; it is usually accompanied by the major charge of infanticide. In other words, the former practically constitutes infanticide by omission, the latter, by commission. The inference of the law, where a woman conceals her condition during the whole course of her pregnancy. makes no preparation for, and calls for no assistance at the time of her delivery, is that she is conniving at the death of her child by omitting to do those things which a woman in ordinary circumstances would not fail to do. But at the same time, the law does not place upon the woman the burden of proving that her child was still-born, but puts upon the prosecutor the burden of proving that her child was born alive, and demands of him a kind of proof of the most difficult kind to establish, because of the secret character of the circumstances in which the birth takes place. This to our mind is quite illogical. The older law placed this duty of proving that the child was still-born upon the mother. During the existence of the present law, the subject has been considered by two Parliamentary Commissions, viz., the Capital Punishment Commission of 1865, and the Criminal Code Bill Commission of 1879, in the Reports of both of which recommendations were made to reversion to the former law.

The former arrived at the opinion "that an Act should be passed making it an offence punishable with penal servitude or imprisonment at the discretion of the Court, unlawfully and maliciously to inflict grievous bodily harm or serious injury upon a child during its birth, or within seven days afterwards, in case such child has subsequently died. No proof that the child was completely born alive should be required. With respect to the offence of concealment of birth, we think that no person should be liable to be convicted of such offence upon an indictment for murder, but should be tried upon a separate indictment." The latter Commission, in the Draft Code which it made, proposed in sections 185 and 186 thereof, that "every woman shall be guilty of an indictable offence, and shall be liable upon conviction thereof to penal servitude for life, who, being with child, and being about to be delivered, with intent that the child shall not live, neglects to provide reasonable assistance in her delivery, if the child dies either just before, or during, or shortly after birth, unless she proves that such death was not caused either by such neglect or by any wrongful act to which she was a party." Section 186 deals with the penalty of neglect to obtain assistance in child-birth in order to conceal birth, where as the result of such neglect the child is permanently injured thereby, or dies either just before, or during, or shortly after birth.

It is highly desirable, indeed, that such should become law as soon as possible, if the crime of child-murder is to be successfully repressed. But even under such a law, curious cases might arise. Perrin de la Touche[1] records a most interesting case of which the following are the main facts:—

It is intended to illustrate a reasonable defence of loss of consciousness on the part of the mother at the birth of her child, the child dying in consequence of want of assistance. In February 1894, he was asked to make an autopsy on the body of a newly-born child which showed that it had breathed freely, but had died of asphyxia and with no marks of violence upon its body. He, thereafter, made an examination of the mother, who lived by herself in an apartment between two suites of rooms occupied by families of workpeople. She had confided the fact of being pregnant to her female neighbours. She was taken in labour in the morning, but after midday the pains became so very severe that she was compelled to take to bed, from which she called for assistance from her neighbours, but in vain. Soon after, the head presented itself at the vulva, and she could feel it with her finger. Thinking that delivery was just at hand, and no one coming to her help, she waited, but becoming impatient owing to the slow progress of the head outwards, and fearing in her ignorance that it might go back, and her life be thus endangered, she thought that she might hasten the process by enlarging the vaginal opening. Thereupon she took a pair of scissors, and made an incision to one side in the tightly stretched posterior vaginal wall, and the child was born, upon which she lost consciousness. When she came to herself, the child and the placenta were lying between her thighs. She then tied the cord with a piece of thread which she got on a table by her bed, removed the body of her child which was dead, and wrapped it in a covering. Hearing her neighbours returning home, she again shouted for assistance, which then came. A wound was found in the situation described which measured 2½ centimetres in length. The examiner reported that he believed the facts stated by the woman were admissible, that unconsciousness or syncope had supervened at the moment of delivery, and that the child had been accidentally suffocated between the thighs of the mother.

Procedure at Autopsy of a Newly-Born Child.—The examination of a dead body of a child is in no wise different from that of an adult, but the following points, after the wrappings of the body have been noted for identification purposes, demand special attention.

(*a*) The general conformation of the body with respect to maturity or immaturity;
(*b*) The appearance of the body; whether it has been washed, or not;
(*c*) The state of the natural openings of body, with respect to presence or absence of foreign bodies;
(*d*) The presence or absence of marks of violence;
(*e*) Height and weight of body;
(*f*) Condition of cord and umbilicus; length of cord; if ligatured or not, and if tied, the character of the ligature;
(*g*) Whether placenta is still united to body or not by the cord.

Internal Examination.

(*a*) *Head Cavity.* Just as in ordinary cases, except that the bone should be divided by strong scissors, and the brain should be divided at level of bone incision, and removed with the calvarium. The basal portion of brain which remains can then be removed, and the base of skull examined. Any attempt to remove the brain in the ordinary way is likely, by reason of its softness, to end disastrously.

[1] *Le Bulletin Médical*, March 1899.

(*b*) *Neck.* Carefully examine for marks of constriction.

(*c*) *Chest Cavity.* After removing sternum, etc., examine chest organs *in situ.* Note the volume of the lungs and the amount of area of cavity occupied by them; the position of highest convex part of diaphragm; the colour of the lungs, and their consistence by palpation; the presence or absence of punctiform extravasations. Remove lungs and heart, *en masse*, and apply hydrostatic test according to the manner given (p. 304). In cases in which they seem imperfectly inflated, take specific gravity of each lung.

(*d*) *Abdominal Cavity.* Note condition and appearance of organs *in situ;* condition of umbilical vessels; presence or absence of food in stomach; presence or absence of meconium in small intestine, and if present, to what amount.

(*e*) Examination of Spine: as to injuries, or *spina bifida.*

Note.—The best evidence of maturity is the presence of an ossific centre of 5 mm. in diameter in lower femoral epiphysis, and of another in the cuboid bone of tarsus; of viability, of an osseous nucleus in the *os calcis* about the size of a pea. (*Vide* Figs. 86, 87.)

INCEST.

The crime of incest is statutory in Scotland, while it is an offence against the canon law only in England. It consists of illicit intercourse between a man and a woman within the limits of prohibited relationship as laid down in the 18th chapter of Leviticus. The Act by virtue of which the crime is statutory in Scotland is 1 Jac. VI. cap. 14, entitled "Anent them that committis incest"; wherein it is ordained "That quhatsumever person or persones that committis the said abhominable cryme of incest, that is to say, quhatsumever person or persones they be that abuses their bodie with sik persones in degrie as God in His word hes expresslie forbidden, in ony time cumming as is contained in the xviii chapter of Leviticus, sall be punished to the death." In order to constitute the crime, attempt is not enough:[1] there must be actual intercourse. The punishment according to statute is death, but the practice is to restrict the pains of law. In R. *v.* Wilson, Glasgow, 1869, the prisoner was sentenced to penal servitude for life: in R. *v.* Colquhoun, to 20 years' penal servitude. Medical evidence in such cases resolves itself into affirmation of non-virginity of the female, or the existence of pregnancy. We have examined four girls for evidence of paternal crime, and although in all of them signs were quite distinct of trafficking in the sexual parts, in only one, in which pregnancy resulted—R. *v.* M'Coll, tried at Glasgow Circuit Court in the spring of 1897—did a prosecution follow.

[1] Hume, i. 452.

CHAPTER XIV.

RAPE AND DEFLORATION.

THE crime of Rape is defined as the carnal knowledge of a female by force and against her will, or of a girl below thirteen years of age, whether by force or not. Up till the passing of the 24 & 25 Vict. cap. 100, sec. 48, the punishment was death; thereafter, periods of penal servitude or imprisonment. The effect of reducing the severity of the punishment was to lead to increased frequency of the crime. It has been stated[1] that the crime had increased by 57 per cent., and two years later, it was stated in Parliament that the increase was as high as 75 per cent. In consequence of this, the Act named was amended by the 38 & 39 Vict. cap. 94 (1875). Later, owing to allegations which were made of the deplorable prevalence of procuration of girls for illicit practices, and which were proved, the 48 & 49 Vict. cap. 69—the Criminal Law Amendment Act, 1885—was passed, which Act is now the law of the land. A short résumé of the provisions of this Act will prove useful.

The Act is divided into three parts. Part I. deals with procuration generally, procuring defilement of a woman by threats or fraud, or by administering drugs.

Section 4 of Part I. enacts that any person who unlawfully and carnally knows any girl under the age of thirteen years shall be guilty of felony, and any person who *attempts* the foregoing shall be guilty of a misdemeanour;

Section 5, that any person who unlawfully and carnally knows or attempts to have unlawful carnal knowledge of any girl being of or above 13 and under 16 years of age, or of any female idiot or imbecile woman or girl, shall be guilty of a misdemeanour, provided that it shall be a sufficient defence to the former part of the section if it shall be made to appear to the court or jury that the prisoner had *reasonable* cause to believe that the girl was of or above the age of sixteen years;

Section 6 applies to a householder, etc., who permits the defilement of a young girl on his premises;

Section 7 deals with the abduction of any unmarried girl under the age of 18, with intent to have carnal knowledge;

Section 8 with any person who detains any woman or girl against her will for the above purpose;

Section 11 enacts against the crime of sodomy.

Parts II. and III. have to do with the suppression of brothels, and with definitions of no medico-legal interest.

The Act applies to the three sections of the kingdom, and in its application to Scotland, the expression "misdemeanour" shall mean a crime and offence, and "felony," a high crime and offence.

What is the legal meaning of carnal knowledge? By the 9 Geo. IV. cap. 31, clause 18, carnal knowledge is held to mean actual penetration of the body of the female,[2] although there be no emission of semen. As to the degree of penetration necessary to constitute the

[1] *Law Times*, January 4, 1845.

[2] Bell's "Notes," p. 83.

Definition of "Deflorations

offence, it has been ruled that the "slightest" penetration of the penis within the vulva is sufficient—even to such a slight degree that the usual signs of virginity are not interfered with.

It is necessary, however, that force be used, and that it be used against the will of the female. What is considered legally as force? According to Macdonald[1] the force used must be force by which physical resistance is actually overcome—in other words *physical force.* Neither does it make any difference what are the means employed to overcome the physical resistance; whether the victim be held by another while the crime is being committed, or the victim is coerced into submission for fear of her life by the act of her assailant, which may be deemed *moral* force, or where her powers of physical resistance are rendered negative by the administration of drugs for the purpose, or where from physical disability the female is unable to offer resistance.

According to Macdonald,[2] Scots law, in the case of an adult woman in possession of all her faculties, holds it essential to the commission of the crime, that the woman has resisted to her utmost, and that a rape would not be committed where the female, after resisting vigorously for some time, at last gave consent. "The resistance," says Macdonald, "must be to the last, and until overcome by unconsciousness, complete exhaustion, brute force, or fear of death."[3] The crime may be committed against any female, whatever her character may be, except in the relationship of husband and wife.

There is no age fixed by law in respect of the male sex before which a male person is held incapable of committing this crime. Probably the earliest age where conviction has followed was that of a boy aged thirteen years and ten months[4] who was tried at Ayr, September 20, 1841. According to the law of England, a boy under 14 is held incapable of committing this crime (R. *v.* Groombridge, 7 C. and P., 582). Section 4 of the Criminal Law Amendment Act, 1885, provides that where the age of the committer of the crime does not exceed sixteen years, he may be whipped, instead of being imprisoned. Although this Act makes it a penal offence in the case of criminal intercourse with an idiot girl, it is open to the prisoner to show that the female was a consenting party.

The following English cases illustrate this. In the case of R. *v.* Fletcher[5] the idiot woman used no resistance, and the prisoner alleged consent; the Court held there was no evidence to go to the jury. In R. *v.* Barratt[6] where the father of the idiot girl caught the prisoner in the act, the Court put it to the jury that if they were of opinion that the girl consented from animal instinct, the accused ought to be acquitted. He was found guilty of attempt. In a case, R. *v.* Campbell, tried before Mr. Justice Phillimore at the Carlisle Assizes, Nov. 1898, where the accused was charged with having had sexual intercourse with a female lunatic, the accused was found guilty but insane, and was ordered to be detained during Her Majesty's pleasure.[7]

As we have already seen, the law enables a prisoner charged with misdemeanour in having carnal knowledge of a girl between the ages

[1] "Crim. Law," p. 192.
[2] *Op. cit.* p. 193.
[3] Hume, i. p. 302; More, ii. pp. 375–376.
[4] Swinton, vol. ii. p. 564; Bell's "Notes," p. 83.
[5] *L. R.* i. *C. C. R.*, p. 39.
[6] *L. R.* ii. *C. C. R.*, p. 81.
[7] *B. M. J.*, 1898, vol. ii. p. 1528.

of 13 and 16, to show that he had *reasonable* cause to believe that she was over the age of 16 years. In such a case,[1] Lord M'Laren in his charge to the jury where this defence was pleaded, said as follows: "It is not enough to establish this defence that from the appearance of the girl she might be believed to be above sixteen. No defence can be founded upon impressions formed from the appearance of the girl; if such a defence could be entertained, it would nullify the statute altogether, because the accused would only have to say that while the girl's age might be only 14, he believed, and had grounds from her appearance for believing, that she was over 16. That would never do. It must not be the mere supposition on the part of the accused; it must be that he formed the opinion upon information, or other intelligible and reasonable grounds of belief. This is the legal meaning of the statute as explained in the judicial opinion of the present Lord Justice-Clerk (R. *v.* Hoggan, 14th April, 1893, I. Adam 1), and you may take it from me that this is the true interpretation of the statute." From these decisions, therefore, it may be held as law that credible information obtained perhaps from the girl herself, or otherwise, is alone a valid defence. But what is to be understood as "other intelligible and reasonable grounds of belief"? It is a matter of the commonest experience, for example, that the age of a person is arrived at from the physical appearances of the body, living or dead, and such opinions are received in Court almost daily. It would be perfectly absurd if a prisoner's opinion of the age of the girl was of itself to be considered as "reasonable cause of belief," but the question at once arises, would it be an intelligible and reasonable ground of belief, if a series of witnesses were to aver that from the physical conformation of the girl it was also their belief? It is a matter of constant observation in daily life, and it is well known by medical men, that the evidences of physical maturity in girls between the ages of 13 and 16 are as variable as is their stature, or their weight, and that there are many girls of such ages who might well be mistaken for a more advanced age than that of sixteen. This is not a case in which physical force has been used, but one in which, although the girl has given her physical and moral consent, she is incapable by the foregoing Act of giving her *legal* consent.

Physical Signs of Rape.—From what has been said respecting the legal interpretation of the kind of force and amount of penetration necessary to constitute this crime, it will be obvious that from the medico-legal point of view the physical signs of rape will vary in different cases, or may even be absent, although the crime has been committed.

It is easy to conceive the possibility of legal commission of the crime without any physical evidence whatever being found on the body of the female to justify a medical examiner in doing more than reporting the negative facts. Since the slightest penetration, without emission, constitutes the crime, no physical signs may be produced; indeed, there may be no evidence whatever of the juxtaposition of the male and female parts. Therefore, the medical examiner is not justified in affirming, because no such physical evidence is forthcoming.

[1] R. *v.* Macdonald, 8, *Scots Law Times* case, No. 72, 37; *Scot. Law Reporter*, p. 756.

1. of deflovation (which means rupture of the hymen)

that a rape has not been committed. If evidence exists, the range of physical signs will vary according to the capability of physical resistance of the ravished female. In the case of young children, females who have been drugged, or those who are in a state of unconsciousness from any other cause, the effects of bodily resistance will probably be absent while the local signs of accomplishment of the act are likely to be well marked; but even then, it will depend upon whether or not the female has been accustomed to sexual intercourse what these signs are. Therefore, we must distinguish in cases of rape between the general signs of physical resistance and the local evidence.

I. *Signs of Physical Resistance.*—If we start from the assumption that a healthy, vigorous young woman alleges that she has been ravished, the first thing the medical examiner must look for is evidence of the signs. If the woman has resisted to the uttermost, she will probably bear marks upon her body of her violent resistance, and probably also, she will have left marks also upon the body of her assailant. In such a case, therefore, the examiner should look for evidence of the signs of violence upon her body, such as wounds, bruises, or scratches. In the absence of these, he ought to exercise, at first, a healthy scepticism as to the truth of her statements, unless she avers, and evidence from the local signs in her sexual parts so far bears out her statement, that she had fainted, or had been drugged. In the case of children, the examiner need not look for evidences of physical resistance, because children are incapable of exercising sufficient resistance whereby injuries are usually caused.

II. *Local Evidence of Accomplishment of the Act.*—Subject to the qualifications already laid down, the examiner would be compelled to conclude that the crime had been completed if the following signs in the sexual parts which are associated intimately with the recent loss of the signs of virginity were found. It will be advisable, therefore, to first discuss the Physical Signs of Virginity.

These signs are comprehended in the following:—

(*a*) An intact hymen,

(*b*) A normal condition of the fourchette and posterior commissure;

(*c*) A narrow vagina with rugose walls;

(*d*) An undeveloped condition of the nipples, and the absence of darkened areolæ round them.

These, taken together, may be held to be clear evidence of virginity; taken singly, they cannot be so reckoned.

I. *An Intact Hymen.*—With regard to the hymen, some have disputed entirely its existence. This, however, is quite wrong. It is to be found as a normal structure in the great majority of virgin females, and in a more or less perfect condition, except in certain cases in which from varied causes it has been more or less destroyed. It may be found to exist from the condition of a slight annular ring fringing the opening of the vagina, to that of a complete imperforate curtain which entirely shuts off the passage from the external genitals. Between these two extremes there are varying forms, all of which contain one or more openings in the membrane, of variable shape, situation, and size. From a want of knowledge of these forms, we

assert that mistakes have been made by examiners with regard to the occurrence of rape. But while its recent rupture would signify the forcible introduction of an instrument of some kind, and while its absence does not necessarily indicate loss of virginity, neither does its persistence unequivocally point to the existence of virginity. It is not necessary to quote many cases to illustrate what is a well-known fact, viz., that a hymen may remain unruptured even where fruitful coition has taken place and pregnancy has resulted, and where it has

FIG. 88.—Virgin Hymen, with central slit. (From Hunterian Collection, University of Glasgow.)]

FIG. 89.—Virgin Hymen, of the semilunar type. (From Hunterian Collection, University of Glasgow.)

remained intact until it was ruptured by the birth of the child, or was surgically opened to permit of the passage of the child.

Albespy[1] records a case of a single woman, aged 23, who became pregnant after a single coitus. At her confinement, the midwife diagnosed presentation of the *cervix uteri* at the vulva. Albespy, on examination, was at first puzzled as to the condition, but concluded that it was simply a tough, unruptured hymen—½ centimetre in thickness—which he slit open by two lateral incisions, and thus enabled the labour to proceed. Lemaistre[2] gives a case in which a woman, aged 42 and married for twenty years, became pregnant for the first time. Although sexual intercourse was regular, penetration had, apparently, never been complete. She aborted at the fourth month, and a fœtid placenta was expelled naturally. He proceeded to examine the uterus, but found for the first time that the mouth of the vagina was practically closed. On further examination, he discovered that the hymen, although elastic, had never been ruptured, but in its centre he found an orifice, large enough to admit the tip of the little

[1] *La Gynæcologie*, Aug. 15, 1898; *B. M. J.*, vol. ii. 1898, s. p. 74.
[2] *Revue Médicale*, June 1898; *B. M. J.*, vol. ii. 1898, s. p. 74.

finger, which he opened up. Another case is recorded[1] where a medical practitioner, called to assist a woman who was aborting, found an extremely tough and dense unruptured hymen with an opening close under the pubis, through which the tip of the forefinger could not be passed without much pain to the patient. The hymen was then opened up under chloroform, and the putrid aborted mass, found in the vagina, removed. In a further case, the hymen was found intact at the birth of a child at full time.[2] Hickinbotham records two cases of women in labour at term with their first children, in each of whom the hymen was unruptured.[3]

On the other hand, the hymen may be absent without any possibility of precursory sexual defloration, from accidents during childhood, from gynæcological examination or operation, or from masturbation.

II. *Normal Condition of Fourchette and Posterior Commissure.*—These are not usually affected in their integrity in cases of rape, unless the violence offered is of the most severe and brutal character, and by instruments other than the penis.

III. *A narrow Vagina with Rugose Walls.*—This is usually present in the virgin female, from the fact that its anatomical conformation has not been disturbed by anything more solid than the menstrual flow. The absence of this characteristic does not, however, necessarily indicate rape; as it may be produced by masturbation, or by mechanical dilatation to befit young girls for sexual intercourse. It was our duty upon one occasion to examine three young girls in whom it was alleged this was done for the purpose named, and where the conditions found were certainly indicative of traffic of some kind.

FIG. 90. — Deflorated Hymen, after Parturition, in Adult Woman. (From Hunterian Collection.)

IV. *Undeveloped Nipples and Absence of Areolæ.*—These are points of negative value only, since a woman need not become pregnant from coition, and since the nipples may present their virgin appearance even in a prostitute.

From a review of the foregoing signs, it will be apparent that they must be found conjointly to afford good evidence of the virgin state.

EVIDENCE OF RAPE.

We return now to consider the signs in the sexual parts of a female, which when found would entitle the examiner to conclude that a rape had been committed.

These are :—

1. A recent, complete rupture of the hymen;
2. Presence of blood, fresh or dried, about the vulva;
3. Marks of bruising, excoriation, or inflammatory action of the parts;

[1] *The Lancet*, vol. ii. 1898, p. 1325. [2] *Ibid.*, Nov. 12, 1898.
[3] *B. M. J.*, vol. i. 1881, p. 1001.

4. Presence of semen in vagina, or on body or clothing of female;
5. To these objective signs, the following subjective signs may be added: (*a*) discomfort in walking; (*b*) frequency of micturition;
6. Possibly, a yellowish or yellowish-green discharge, more or less plentiful, from vagina.

There should be no difficulty in finding laceration or rupture of the hymen when it is present, but the amount of the laceration will obviously depend upon the area to which the hymen originally extended, and to the completeness of the coition. The laceration presents a tear, or series of stellate tears in the membrane, marked by a bloody or inflamed line or lines. The remains of the hymen constitute what are afterwards known as the *carunculæ myrtiformes*, which, shortly after rupture, are red and look irritated, but which, after some time, become shrivelled, and have the appearances of different-sized, small, round projections of mucous membrane bounding more or less the vaginal entrance. Notice must be paid to the presence of blood about the vulva, thighs, and pubic area of the body of the female, and on her clothing. It sometimes happens from the unusual quantity of effused blood that the examiner may be led to suspect that the assailant has also been wounded locally in the genitals. In two cases which we examined, the quantity of blood found on the girls' underclothing, and at the place where the crime was committed, was greater than could have been looked for from the lacerated area of hymen. On examination of the suspected males who had been apprehended, a recent rupture of the *frœnum penis* was found in each case. We shall refer to one of these cases later. But apart from any such injury to the male, coitus may cause considerable bleeding, where in the hymen a small arterial vessel has been incompletely torn. We have not seen this in rape, but we have seen it in the case of first coitus after marriage. The examiner must be on the alert, however, that he is not being deceived by a false charge of rape, and that the presence of blood is nothing more than menstrual blood, or that the coitus has not merely induced the menstrual onflow. It is always necessary to discover the laceration of the hymen where hæmorrhage is present. There will be corroboratory evidence of the use of violence if bruising, or excoriation of the external genitals be found, since it indicates that the violence has not been confined to the vaginal opening, which would likely be the case if a foreign body, other than the penis, were intromitted either by the woman herself, or by another, in order to simulate rape.

Accompanying the foregoing signs, unequivocal evidence of their cause is afforded when semen is found in the vagina, upon the person, or upon the clothing, of the female. It is important in all cases of alleged rape that the vagina should be examined for spermatozoa. We have found by experience that the best way—and the least painful to the female—to obtain vaginal fluid for microscopic purposes, is to introduce into the vagina a pipette, the pointed end of which is slightly curved, and the other end of which is covered with a miniature rubber-ball; indeed, a somewhat elongated ink-pipette is as good an instrument as any, since its introduction is easy and painless. When

introduced against the posterior wall, slight pressure backwards should be made so that a depression is formed in the vaginal wall, into which any vaginal fluid will gravitate, which, on allowing the rubber-ball to slowly expand, will be sucked up into the pipette. Thereafter, a dozen microscope slides may be dotted with the discharge, and then examined by microscope. These may be allowed to dry, and before being examined may be stained with dilute carbol-fuchsin or gentian violet, which enables the examiner the more easily and rapidly to detect the spermatozoa. The hair of the *mons veneris* and of the body area in and around the external genitals, and any suspicious stains upon the clothing, should be examined afterwards for evidence of the emission of semen, in the manner to be hereinafter described. The absence of semen, however, does not of itself indicate that rape has not been committed, because emission may not have taken place.

In addition to the foregoing signs, the female may complain of difficulty or pain in micturition and discomfort in walking; but these, in our experience, are rarely encountered where the rape has been committed upon an adult female; they are much more common in children or young girls.

In comparatively rare cases, a purulent discharge of a yellowish or yellowish-green colour may be found about the genitals. Indeed, in the case of children, its presence is most commonly the reason why a mother suspects or thinks that her child has been tampered with. Such a discharge may be due to gonorrhœa from infection by actual coitus or contact with an infected male, or to simple vulvo-vaginitis or vulvo-vaginal catarrh, due to a variety of irritating causes. It is a fact beyond dispute, owing to the prevalence of a widespread belief amongst persons of the lowest classes that coitus with a healthy young person of the opposite sex will cure them of gonorrhœa, that gonorrhœal infection is conveyed to young children—especially females—and hence it is that rape upon young female children under twelve years of age is so prevalent, along with the other reason that females at these earlier ages are less able to offer resistance. A far more common cause of purulent discharge, however, is vulvo-vaginitis. This arises from uncleanliness, scratching with dirty fingers, local irritation, such as thread-worms in rectum, cold, etc., and it might easily be mistaken by a careless examiner for gonorrhœa. Of some 70 cases, in which we have examined women and girls for evidences of alleged rape or indecent assault, 11 of them bore evidences of vulvo-vaginal catarrh. The following case affords several points of interest:—

A girl of seven years, playing with her companions near a coach-house where an ostler was employed washing a carriage, was called by him into the harness-room to go a message. The man there attempted to violate her, but she screamed so lustily, and her companions came in so quickly to find the cause, that the man was baulked in his attempt. She did not complain to her mother until two days afterwards, when, on her mother examining her and finding the parts unusual, we were asked to examine her. She was suffering from a muco-purulent discharge which coated the vulva, with superficially eroded patches of mucous surface. The man was apprehended, but he was found to be free from any disease. We gave it as our opinion that she was suffering from vulvo-vaginitis, and, after local treatment, she was well in a few days. The man was released

from custody for want of evidence of attempt, chiefly because the girl herself said that he did nothing more than catch her and throw up her dress, which could not be corroborated. She was a weakly girl.

This resemblance of vulvo-vaginitis to gonorrhœa is not confined to its physical appearances. Vigereni and Casarini[1] from their examination of the bacteriology of this disease affirm that clinically it is often impossible to distinguish between it and gonorrhœa, and further that in simple vaginitis a diplococcus is commonly found which microscopically is very like the gonococcus, but differs from it in that it does not respond to the same culture tests. They never found the gonococcus in the vaginæ of healthy children, and in the cases of those in which it was found, the history of the contagion could be traced. In doubtful cases, therefore, bacteriological examination should be resorted to. The following case is somewhat remarkable :—

A mother brought her child to the police. She was suffering from a muco-purulent discharge from the vulva, and inflammation of the parts. The girl stated that two boys had "done things" to her. The boys were apprehended and brought from their beds to the police office, where we examined them. On further inquiry at the girl, it was elicited that the boys had thrown her down in a dark passage and had criminally assaulted her two or three days before her mother brought her to the office. On looking at the boys one would have said it was impossible, as one of them was about thirteen years of age, the other being younger, and both looked physically puny. The younger was examined first, but he presented nothing unusual. On examination of the elder, we found a muco-purulent secretion round the foreskin and issuing from the urethra itself. There was no rupture of the hymen. We gave it as our opinion that the boy was suffering from gonorrhœa, and that simple contact with the girl might convey the disease to her. The painful part of the case was that the boy confessed that he had been bribed by a young adult prostitute to lie with her, from whom he had evidently contracted the disease. He was charged with indecent practices, and convicted.

FIG. 91. — Hymen of Child of Four Years —Annular type. The illustration also shows the prominence of the Urinary portion of the Genitals. (From Hunterian Collection.)

Where rape is fully accomplished, the extent of the local violence is usually greater in the case of girls below twelve years of age than in those above puberty, or in women. The reason for this is to be found in the fact that at the earlier ages the urinary portion of the external genitals is more developed forwards than just before or after puberty, when the genital portion projects most (the urinary receding within the vulva), and also because more violence is necessary for the intromission. Ogston[2] records the case of a girl of eleven who died from the effects of this crime, and upon whose body post-mortem dissection disclosed tearing of the external genitals and perinæum, the vagina torn away from the uterus, and a large rent in the peritoneum, with effusion of blood into the abdomen. Other cases have been recorded of like severe injuries, although not so extensive as in the case quoted.

It is almost incredible that injuries such as these could be

[1] *La Rif. Med.*, Nov. 29–Dec. 1, 1898; *B. M. J.*, vol. i. 1899, s. p. 19.
[2] *Op. cit.* p. 91.

committed during the act of coitus, but we are bound to believe that it is possible, from recorded cases in which coitus for the first time under legal conditions produced such injuries.

Looof[1] records a case in which laceration of the posterior vaginal fornix was produced by a natural force. The woman was aged 23, and coitus had occurred in the sitting posture. The vagina was torn from the back of the *cervix uteri* for 1½ inches, and in the wound an artery was opened which bled freely, but the peritoneum was intact. Mylott[2] gives the facts of a case in which he was called in the night to attend a newly-married woman who was bleeding freely. During the first act of coitus she felt a sharp pain, followed immediately by profuse hæmorrhage. On examination of the vagina, a tear was found which, beginning at the mouth of the vagina, extended upwards to the left of the median line to Douglas' pouch, which it crossed, and there passed to the right side of the vagina.

Dilatation of the vagina is stated by certain authors as an additional sign of rape; but though seen in cases where coitus is not uncommon, it is not found after a rape in which coitus has been effected for the first time. It must be exceptional to find cases such as that recorded by Casper,[3] in which the mother of a girl aged ten was charged with gradually dilating the vagina in order to befit her for commercial traffic with men.

In many of the cases which we have examined for the evidences of alleged rape, no physical signs were discoverable, as the hymen was intact, and there was no evidence of bruising locally, nor of injuries generally; but these were mostly in girls of tender years. In certain others, the hymen was ruptured; but in no case was there any more extensive laceration than that. The following case illustrates several of the points which the examiner has to consider.

H. L., a married woman, aged 38, was attacked by a vigorous man on the tow-path of a canal. She screamed and resisted vigorously. On assistance coming to hand, the assailant ran off. She at once proceeded to the police station and lodged her complaint, and we examined her shortly thereafter. The following was her condition: Her clothing was soiled from coal-dust and dirt, her face being likewise more or less covered with the same. Her face was swollen at the angle of the lower jaw on the right side, her upper lip was bruised and swollen, the right side of her face and throat was marked with many scratches and abrasions, and there was a bruised swelling, with abrasions, on the right temple. On examination of the sexual parts, it was found that she was menstruating, that there was dried mud on the lips of vagina, and there were bruises and slight abrasions of outer aspect of right thigh. She averred that intromission was not complete. A man was apprehended a few hours after, closely corresponding to the description she gave of her assailant, but examination of his body revealed nothing to connect him with the crime, and the woman herself was not quite certain of his identity, as the act was committed at night.

Examination of the Accused.—When his consent is obtained, it is a good plan to examine the accused, for it may happen that evidence will be forthcoming which may connect him with the crime. This is true of suspected transmission of gonorrhœa. One of our colleagues informed me of a case in his experience in which a man was charged with this crime, and had, at the same time, conveyed the contagium of gonorrhœa to the woman. He was examined, but although no sign of discharge from the urethra could then be seen, the lips of the meatus

[1] *Ann. de Gynéc. et d'Obstét.*, March 1898.
[2] *B. M. J.*, vol. ii. 1899, p. 760.
[3] *Op. cit.* vol. iii. p. 318.

had that pouting, red, swollen appearance so characteristic of specific urethritis. He was placed in a cell under observation. It was observed that he always urinated before the visit of the surgeon and thus washed out the urethra; thereupon, all facilities for performing this act having been taken away, and his clothes being entirely removed, the discharge quickly made its reappearance, which ensured his conviction. Scratches upon the face or hands, or bites upon the trunk or limbs, or bruises on the legs from kicks by the female, are strong corroboratory evidence of the averment of the complainant that she resisted vigorously. Besides, rupture of the *frænum penis* may be found, and affords, when present, good *primâ facie* evidence of the forcible intromission of the organ into an incommensurately smaller passage or canal. In one case (*vide ante*, p. 74) this was found on a man who was charged with rape of a girl, whose underclothing was saturated with blood, the floor of the lobby where the crime was committed being also covered with blood. The man, as usual, strenuously denied any knowledge of the charge, but the finding of blood in the seams of the lower front part of the body of his trousers which bore marks of recent washing, and on the nails and soles of his boots, only too clearly pointed to the fact of his relationship to the girl. He pled guilty at his trial.

Examination of Stains upon Clothing for Spermatozoa, and of Discharges for Gonococci. — It is usually necessary, as corroborative evidence of the rape, to examine the underclothing of the person assaulted for the presence or absence of seminal stains. From a long experience of this work, we are able to state that it is not so easy a matter as the student may imagine from the ordinary accounts in books. In the first place, the underclothing of those ordinarily so assaulted is by no means characterised by its cleanliness, and indeed very often bears marked traces of dirty habits; consequently, the examiner may expect to see a considerable variety of stains, both of size and of composition, ranging in colour from red, brown, yellowish, to a grey. Those of a red colour are commonly composed of blood, or blood and serum, from the menses; of a yellow or yellowish colour, from fæces, leucorrheal discharges, or urine; of a brown colour from fæces, or iron stains; while those of a greyish appearance may be due to semen. Only patient, painstaking, and repeated examinations will make any one familiar with their composition, and with the physical appearances of stains arising from their composition.

Seminal stains, when dry, are of a greyish-white appearance, and impart a stiffened, starched feeling to the clothing. But leucorrheal discharges have nearly identical physical characteristics. Both are found in like positions on the under-garments, and therefore nothing short of careful microscopic examination will determine the difference. The attention of the examiner should be directed first to the physical appearances and characters of the stains, and where there are several, he should select at least two for examination. We have no belief whatever in any chemical test such as Lassagne's, which is based upon the known chemical fact that seminal fluid contains no albumen, and therefore no sulphur, nor even in the detection of the odour of semen by the addition of warm water to stained pieces of clothing contained

in a watch-glass, for we have tried them both many times without any conclusive result; moreover, such are not required when a microscope is at hand, for if the quantity of semen be sufficient to make any response to the tests named—and that, in our experience, is rare—there will be more than enough for the convincing proof of the microscope. The stain or stains, when they are presented for examination, are usually in a dry condition, and before their constituents can be examined microscopically they must be so moistened as to secure that a portion of the constituents will pass on to the slide. The best form of procedure is as follows:—

1. Cut out, with as little handling as possible, the stains upon the cloth to be examined, keeping each stain apart in a separate watch-glass. If the stain be ample, cut a portion of it into small pieces.
2. Drop into the watch-glass, over the cloth, as many drops of a 10 per cent. solution of glycerine in water (distilled, preferably) as will be judged sufficient to thoroughly moisten the cloth.
3. Allow the whole to stand under a small bell-jar, or under cover of some kind, for a couple of hours, at the end of which the cloth will have soaked up the fluid.
4. Prepare a series of clean glass slides, and with a pair of flat-pointed forceps touch each slide with the moistened cloth, until six slides, at least, have been so treated.
5. On three of them place cover-slips. Dry the other three slides after the bacteriological fashion, by passing them slowly through the column of heated air which rises from a Bunsen, and at some distance (about $\frac{1}{2}$ to 2 feet) above the flame, repeating the process two or three times, till the film is dry; treat each of the three slides in the same way.
6. Cover the film with weak gentian-violet stain, warm gently for $\frac{1}{2}$ to 1 minute; wash off stain in a gentle stream of water from a wash-bottle, put on a cover-slip, and examine microscopically.
7. Use a microscope magnifying not less than 500 diameters, and examine in a suitable light.

If spermatozoa are present, the above procedure will enable the examiner to detect them, and he will likely discover that the stained specimens—if the procedure has been carefully performed—will show the spermatozoa much better, and permit of their more rapid detection, than the unstained, because the staining renders them more opaque, and being coloured, the eye catches them more quickly. The difficulty of discovering them in clear, unstained fluids, is due to their translucency, to overcome which manipulation of the angle of light is required. From personal experience of the foregoing method of treatment we can speak definitely of its suitability, as isolated spermatozoa may easily be picked out in the field. It is by no means difficult to distinguish a spermatozoon when it is seen entire, because of its distinct head, and long filamentous tail. Spermatozoa vary in total length from $\frac{1}{800}$th to $\frac{1}{1000}$th part of an inch, the diameter of the head being about $\frac{1}{9000}$th to $\frac{1}{10000}$th part of an inch; in other words, the head is about one-third the size of a human red blood corpuscle, and the tail is from five to six times the length of the head.

Semen usually contains not only spermatozoa, but also sperm cells in different stages of development, and in addition, clustered crystalline bodies, not unlike some of the fatty acids—probably cholin or lecithin. The precise character of the last we have not yet been able to determine. It has been asserted by certain writers that, in the

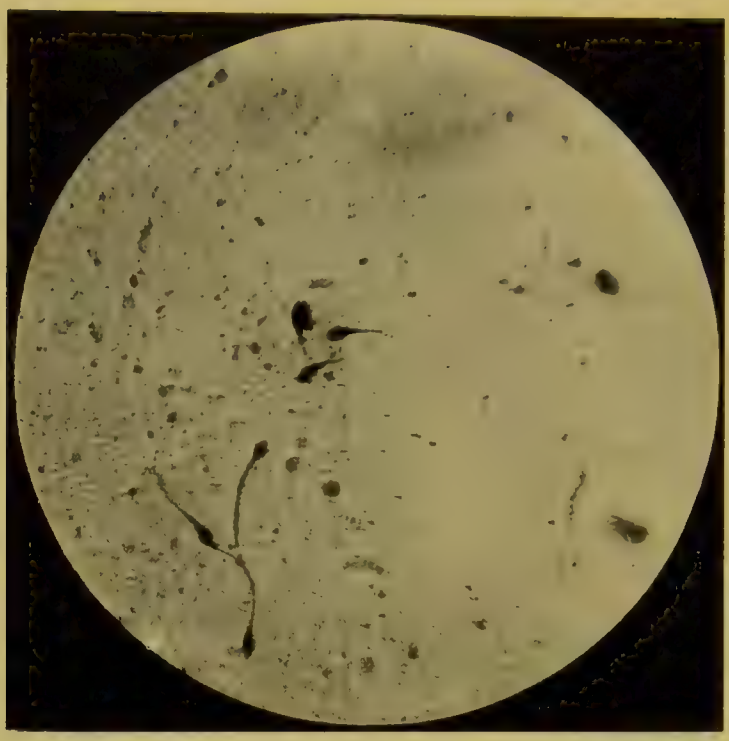

FIG. 92.—Photo-micrograph of Human Spermatozoa stained by Methyl-violet. × 500 diameters. (Author.)

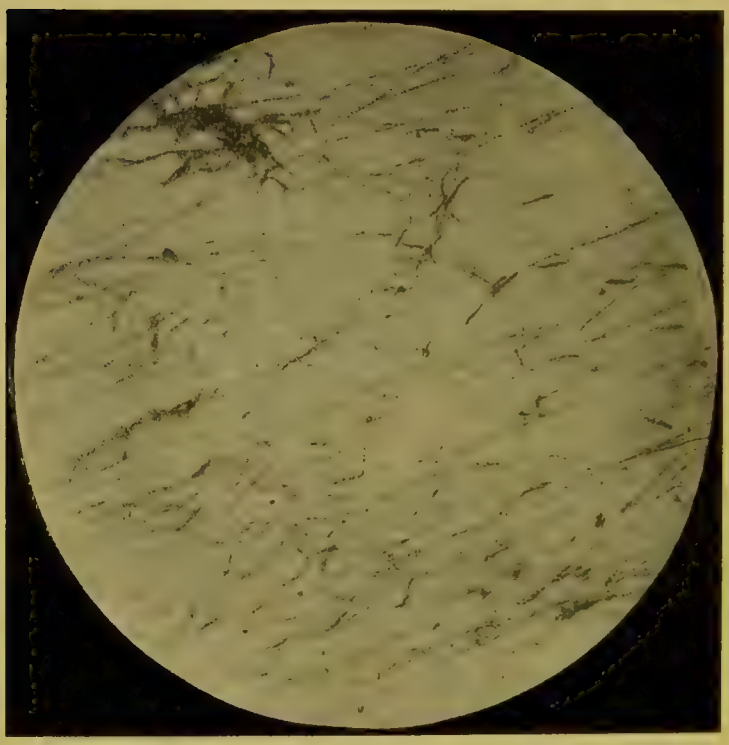

FIG. 93.—Photo-micrograph of Spermatozoa of Rat. × 500 diameters. (Author.)

history of the same man, there are periods when the semen contains few, if any, spermatozoa, and is mainly composed of sperm cells. We have not been able to verify this in the case of men whose functions are in a state of physiological activity. Casper,[1] however, gives a list of about a dozen persons of different ages, in whose bodies after death no spermatozoa could be found in the seminal vesicles; and other writers have recorded similar observations respecting men advanced in age.

The question has arisen—Whether an examiner would be justified, in the absence of spermatozoa, in affirming that a given stain was of seminal origin? Casper goes the length of saying "that though stains are proved to be of seminal origin when those specific zoosperms are found in them, yet that the absence of spermatozoa does not prove that these stains have not been caused by human semen." We personally act upon the view that if spermatozoa are not found in the stain or stains, we cannot positively affirm that such stains are seminal. Neither is the discovery of spermatozoa in stains an easy matter, for the obstructive factors are many; these partly consist of the necessary delicate manipulation which is required, the character of the fabric to be examined, and not least, the age of the stain and the usage to which it has been subjected before it has reached the hands of the examiner. Spermatozoa have been discovered long after their emission. Roussin affirms[2] that he was able to recognise them after 18 years, and others at less long intervals. It is quite clear that they may be discovered within the usual periods required for medico-legal purposes.

It is futile to attempt identification of seminal stains upon clothing by any characteristic odour, since it is likely to be masked by urinous and fæcal odours. Neither can much reliance be placed upon chemical means. Florence affirmed that the reaction which ensues upon the addition of iodine and potassium iodide is characteristic of human semen. The reagent which he employs is composed of a solution of 1·65 grammes of potassium iodide and 2·54 grammes of iodine in 30 c.c. of distilled water, and the reaction consists in the formation of dark-brown crystals, long-shaped, rhombic, or acicular in shape when the reagent is mixed with an aqueous extract of seminal fluid. The test is to be employed as follows: The seminal extract is made by warming the stains in a little water on the water-bath, acidifying with dilute hydrochloric acid, cooling, and adding some dry ammonium sulphate. The extract so treated is then filtered, the reagent added, and the mixed fluid then subjected to microscopic examination. Richter[3] believes that the reaction which happens is due to cholin, either normally present in semen, or formed in it by the decomposition of lecithin, which is commonly found in urine. Kippenberger[4] finds that the reaction is formed with the seminal discharges of a large variety of animals, in addition to that of man, and also that it takes place with menstrual blood, or even, at times, with normal blood. We believe that the presence of crystals of cholin or lecithin in a suspicious stain is almost characteristic of human semen, apart from the discovery of spermatozoa; but the observation must be more fully confirmed before this can be made to rank in importance with spermatozoa themselves.

But the attention of the examiner must not be confined to the kind of stains mentioned; it is important, especially in cases where there

[1] *Op. cit.* vol. iii. p. 294.
[2] *Ann. d'Hyg.*, 1867, vol. i. p. 152.
[3] *Wien. klin. Wochenschr.*, 1897, p. 569.
[4] *Zeit. für Untersuch. der Nahr. und Genussmittel*, 1898, p. 602.

has been recent rupture of the hymen, that blood-stains should also be examined for spermatozoa, as they may pass from the body of the female in the blood which flows from the breach in the hymen. Leucorrheal stains are characterised by the abundance of cells of squamous epithelium, and if the discharge has been muco-purulent, by pus cells in addition, the multiple nuclei of which can be rendered apparent by treatment with weak *liquor potassæ.*

Spermatozoa cannot readily be mistaken by a skilled observer for anything else, provided whole spermatozoa are visible, and as in no case, unless an unmistakable spermatozoon is present, would an examiner be justified in affirming its seminal origin, it matters little whether its flagella or tail is confused with a fibre of hair or wool, or that of any other fabric. It cannot be often enough repeated that the presence of spermatozoa of an indubitable character must be established to identify positively the stain with semen, and that no man would be justified who proceeded on such an examination unless he were skilful enough to recognise easily the difference between spermatozoa and fibres, or anything else. There is one organism which has been described by M. Donné[1] as simulating in appearance that of a spermatozoon, and which is figured by him in his work. According to that observer, the head is much larger and contains granular matter, and from it several ciliæ branch off—characters which differentiate it at once from the spermatozoon. We have sought for this organism many times in the vaginal mucus of many women, but have entirely failed to discover it.

Examination for the Gonococcus of Neisser.—Since it has been proved without doubt that this micro-organism is the cause of gonorrhœa, the medical examiner is now provided with a means of distinguishing between vaginal discharges which, clinically, are practically identical. It is not difficult to stain appropriately some of the discharge in the usual bacteriological method. If a thin film of the purulent material be put on a slide and dried, be covered with Löffler's methylene-blue stain for one minute, and then washed till most of the blue colour disappears, and, thereafter, be counterstained with watery eosin for between 20 and 30 seconds, the kidney- or bean-shaped cocci will become easily seen by a $\frac{1}{12}$th inch oil immersion objective. The diagnostic characters of this micro-organism are its shape, and its disposition in distinct pairs in each pus cell. In order to make the diagnosis absolutely certain, cultural tests should be employed. The gonococcus can be cultivated with success in a mixture of two parts fluid agar in albuminous urine, or one composed of two parts agar, one part of human urine, and 5 per cent. per volume of egg-albumen; or the pus may be sown on agar plates streaked with fresh human blood. It may be differentiated from the *diplococcus urethræ communis*, which though larger than the gonococcus might be confused with it, by its absence of growth in alkaline gelatine, a medium upon which the latter grows freely.

But Rape may be committed upon the dead as well as the living, and evidence of the crime may be found upon the dead body. It will be the duty of the examiner to determine, if possible, whether the

[1] *Cours de Microscopie*, Plate ix.

female died from the effects of the assault combined with the rape, or whether she died from the violence and was violated sexually afterwards. Each case must be decided upon its own special merits, with special reference to the character, situation, and severity of the wounds found upon the body, and to the local violence with respect to direction of blood-flow. In a case tried at the Carlisle Summer Assizes, 1889—R. *v.* Kerr—the prisoner was charged with murder in respect that he had committed the crime of rape upon a woman, the cause of whose death, however, was not the injuries thereby produced, but the entrance of vomited matters into her larynx produced by the violence offered. Locally, however, there were two lacerations found in the

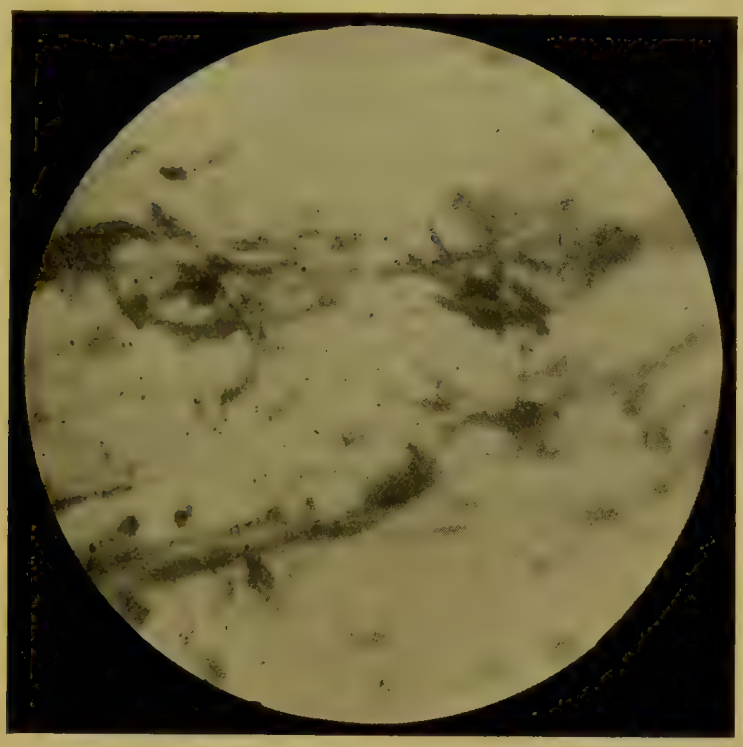

FIG. 94.—Photo-micrograph of Gonococcus in pus from Gonorrhœa. × 1200 diameters. (Author.)

vagina, in addition to a mark of excoriation on the abdomen and blood on the genitals externally. The most damning point in the circumstantial evidence—for it was wholly circumstantial—was that the knees of the prisoner's trousers were soiled with mud corresponding to that of the place where the assault was committed, and adherent to the mud were some red-coloured woollen fibres resembling those which partly composed the fabric of the woman's petticoat. Although the prisoner averred that the woman had given assent, he was found guilty. In the Léotade case, the principal facts of which are narrated by Sir James Stephen,[1] the body of the girl bore marks of a violent attempt of rape, which however was unsuccessful because the girl was not mature, and in addition, of violence to the head which had

[1] "Criminal Law of England," pp. 318. *et seq.*

been caused by a broad blunt instrument. In the St. Cyr case, also dealt with by the same writer,[1] it would appear as if the female victims were first killed, and ravished afterwards. Indeed in some of the cases recorded, it is almost inconceivable how the extensive genital injuries could have been produced, except by the forcible intromission into the vagina of instruments other than the male organ, which injuries in themselves, because of their shocking brutality, almost indicate demoniacal possession in the assailants.

There are some general questions which may arise in a charge of rape regarding which a few words must be said.

I. *Can a healthy, adult female be violated by one man?*—Casper answers this question in the affirmative on the basis of a case the facts of which he records,[2] and of which the following is a summary: a man persuaded a young woman of five-and-twenty to accompany him in the dark into a public park. He there tried to violate her, and ultimately seized her round the body, flung her to the ground, threw her dress over her head, and at last effected his purpose. The hymen, on examination, was found to be completely torn. Her statement was confirmed by the fact that the police, who hurried to the place because of her cries, found her assailant in the condition of actual satyriasis.

There can be little doubt that the violation may be effected in a case where the woman physically resists until worn out, or even where, because of the excitement and resistance, she faints. But one must not be guided to a general opinion from a particular case. The foregoing illustrates the actual accomplishment of the act in one case, and its possibility in others. At the same time, a medical witness would only be justified in offering an opinion on this point after careful consideration of the whole facts of the particular case regarding which his opinion is asked, for he must bear in mind that so long as a woman is in complete possession of her senses, it does not require great physical strength to deny entrance to her body by the disposition of her limbs. Where the act is accomplished, one is forced to the conclusion either that she has become physically worn out and incapable of further resistance, or that there has been temporary loss of consciousness. Where marked disproportion of age, size, and apparent strength in favour of the female are present, a charge of rape is very likely, and rightly, to break down, because consent is likely to have existed. In most cases of this kind, however, such questions are not likely to be asked of a medical witness, because the judge and jury are quite able to form their own opinions on sight of the supposed victim and assailant. The business of the medical witness is to decide from the appearances on the body of the female whether carnal knowledge of the woman has been effected forcibly and against her will, and the Court will form its own opinions on the other point. Nor has the medical witness anything to do with the previous character of the woman; the effect of a bad character upon the issues of the case is one for the Court and jury alone to decide.

II. *Is it possible for a woman to be violated during ordinary sleep without her knowledge?*—The answer to this, upon which all medical jurists are agreed, is that it is highly improbable in the case of a

[1] Idem, p. 345, *et seq.*

[2] *Op. cit.* vol. iii. p. 311.

virgin. We should say that it is impossible, because of the pain attendant upon a first coitus. It is further agreed that it is not impossible, although extremely unlikely, in the case of women accustomed to sexual intercourse. This latter answer is based upon certain cases which, in our opinion, however, do not entirely warrant its finding. At the same time it has been established in the High Court of Justiciary of Scotland that it is possible for a man to have coitus with a woman during her sleep.

A man named Sweenie was convicted, June 18, 1858, on the charge of "wickedly and feloniously having carnal knowledge of a woman when asleep, and without her consent, by a man not her husband;" and a man named M'Ewan or Palmer, at Dumfries Circuit Court, September 26, 1862, on the same charge.[1] The Criminal Law Amendment Act, 1885, section 4, last sub-section, enacts and declares that any man who induces a married woman to permit him to have connection with her by personating her husband shall be deemed guilty of rape. A case, based upon the charge of having carnal knowledge of a woman when asleep, or in a state of insensibility or unconsciousness from the effects of intoxicating liquors, was tried before Lord Ardmillan in the High Court of Justiciary, on November 20, 1871, in which two men were implicated, but after trial, the charge against the accused was found Not Proven. The woman was found dead the morning after the outrage. In our experience, we have only known one attempt made of this kind, and under the following circumstances. A young married woman, M. H., was the wife of an ironworker who went to work at 4 A.M. every morning, and who, not to disturb his wife on going out, left the door on the latch. The prisoner, who was a fellow-worker and who was acquainted with these facts, tried to personate her husband by entering her bed, but the woman, awaking when he tried to have coitus, raised the alarm, whereupon the man fled. On examination, we found her to be pregnant six months, but not to have sustained any injury.

Cases of violation of females during a state of unconsciousness in fits, in a faint, or in hysteria, and under the influence of anæsthetics, have been duly recorded. That the act may be accomplished under such circumstances goes without saying. It is unfortunately true that medical men and dentists, by reason of their professional work, are liable to have charges of this kind preferred against them by certain women after the administration of chloroform or other anæsthetic. This is well established, although the reason for it is not so well understood. We have been informed by the police authorities of a division, within which is a large hospital, that such charges are by no means uncommon, and that having investigated several of these, they have found them absolutely baseless.

As illustrative of the risk to the medical practitioner, the following case will be instructive.[2] A medical man was charged with criminal assault on a girl. According to the evidence the girl was hysterical. The prisoner met the allegation with emphatic denial. He was found not guilty. Mr. Justice Channell said it was his usual practice not to comment on the verdicts of juries, but he felt it his duty to state that he never tried a case which left less doubt in his mind. There could not be the slightest doubt of the prisoner's innocence, and it was only justice to him to say so.

III. *Can a woman become pregnant from an act of Rape?*—Assuredly she can, is the only answer. Any one acquainted with the factors of conception is well aware that, under apt circumstances,

[1] Irvine, vol. iii. p. 109; 31 *Scottish Jurist*, 24; Irvine, iv. p. 227.
[2] *B. M. J.*, vol. ii. December 17, 1898.

conception will follow whether the female be consenting or not. Apart from rape we are acquainted, moreover, with the facts of a case in which impregnation occurred from mere contact of the male organ and emission, without any attempt at penetration sufficient to injure or affect the hymen. We delivered the woman, who was married to the offender—her lover,—later, on the fact of her pregnancy being established.

Procedure in Examination of Cases of Alleged Rape.

In proceeding to the examination of persons in connection with a charge of rape, there are certain hints which will prove of service to the inexperienced.

I. With Reference to the Female. When the charge of rape is laid with the police, the practice in Scotland is that a medical man—the police surgeon of the division of a city, or of the town—is asked to examine the complainant, who, by laying a charge, is presumed as willing to afford all evidence, even to the examination of her person, with a view to the detection of her assailant. The medical examiner should ask no questions as to the commission of the crime, except as to the time when the alleged assault took place. Then the following points, in addition to the time and place of examination, and the name of any other female present thereat, ought to be noted :—

(*a*) The general physical appearance of the female ;
(*b*) The presence or absence of marks of violence upon her body ; their character, and their position, when present ;
(*c*) The presence or absence of marks upon the external clothing, where the assault is alleged to have taken place out of doors ;
(*d*) The condition of the genital organs, with respect to : (1) presence or absence of blood ; (2) signs of bruising, or other injury, of vulva ; (3) presence, or absence of hymen, and if present, its condition with respect to laceration ; (4) if lacerated, the extent and direction of the rupture ; (5) the existence or absence of menstruation ; and (6) whether from the appearances of vulva and vagina, the female has been habituated to coitus.
(*e*) With a pipette as described, to obtain some vaginal fluid for microscopic examination ;
(*f*) If a muco-purulent, or purulent discharge be present, to secure some in sterilised capillary tubes for bacteriological examination ;
(*g*) Examination of the underclothing for stains, wet or dry, having the physical appearances of semen, if such are present ;
(*h*) Secure the garment for further examination of stains for spermatozoa ;
(*i*) If spermatozoa are found in the stains, preserve the specimens found for future reference, if required.

II. With Reference to the Male.

After cautioning him of the possible results of the proposed examination, and apprising him of his right to give or withhold his consent, after consent has been given in the presence of a third party, attention ought to be given to the following points :—

(*a*) Any, and if so, what, appearances of violence are present upon his face or neck, or more locally in the neighbourhood of the external genitals ;
(*b*) Condition of the male organ itself : (1) with reference to marks of injury, such as scratches, or rupture of frœnum ; (2) marks of blood, etc. ; (3) marks or stains of blood upon clothing, trousers especially, or boots.
(*c*) His physical conformation.

In the examination of the dead body of a female upon whom it is suspected this outrage has been committed, the kind and extent of physical examination will be very much the same as in the living body.

SODOMY, PÆDERASTY, AND BESTIALITY.

It is apparent from a perusal of the Scriptures of Chapter xx. of Leviticus, 13-16 verses, that unnatural crimes between man and man, man and a beast, or a woman and a beast, have existed from very early times in the world's history. According to the Mosaic law, such persons and the animal with whom the abomination was practised were to be put to death. According to the law of Scotland even now the offence is a capital one, only it is usual practice for the prosecutor to restrict the pains of law. According to the 24 & 25 Vict. cap. 100, sect. 61, the punishment is limited to penal servitude for life, or for any term not less than ten years; and in terms of section 11 of the Criminal Law Amendment Act, 1885, any male person who, in public or private, commits, or is a party to the commission of, or procures or attempts to procure the commission by any male person of, any act of gross indecency with another male person, shall be guilty of a misdemeanour, and shall be punished by imprisonment for a term of not more than two years, with or without hard labour. The law applies to both the active and the passive agent, if the latter be a consenting party.[1] This unnatural crime is, perhaps, more common than is supposed, but charges frequently break down before trial for want of lay or medical evidence. Attempt to commit the act is also a crime. Two men were tried at the Glasgow Circuit Court, Sept. 1877, on the charge of attempt. One pleaded guilty, and was sentenced to one year's imprisonment. Of the few cases in which we have made examination of the accused parties for this alleged crime, in one only was there evidence sufficient to justify the statement that the crime had been committed. The history of the case, briefly, was this :—

Two young men, one of them married, lured a boy into a private place on some pretence, and while the married prisoner held the boy, the other prisoner unclothed the boy and committed the act. On examination of the boy, we found four recent linear lacerations of the anal mucous membrane radiating in an outward direction, with evidence of bleeding, which unmistakably pointed to forcible penetration of a foreign body and consequent distension. The men were convicted in August, 1897, at the sitting of the High Court in Glasgow. A most remarkable case is recorded[2] in which a male masqueraded in female dress for several years of his life, playing the parts of an actress, and had been the passive partner in coitus *per anum*. The *anus* was found wider and larger than ordinary, its *introitus* was smooth instead of being puckered, indicating the use to which it had been put.

On the Continent of Europe, if we may judge from the amount of attention the subject receives at the hands of medical jurists, this unnatural crime seems to be more common, at least is more detected, than in this country. Several cases are recorded by Tardieu, Casper,

[1] Hume, vol. i. p. 469; Brown, vol. ii. p. 671.
[2] *London Med. and Physical Jour.*, Feb. 1833, p. 168.

and others. But even in our own country the cases of R. *v.* Boulton and Park, tried before the Court of Queen's Bench, in 1871, and the still more recent case of Wilde, show that it exists also in populous centres, especially in shipping and garrison towns, where compulsory celibacy, by reason of occupation, prevails.

The lesions which ought to be looked for by the examiner are of the following character :—

(*a*) Recent lacerations of the mucous membrane of the anus ;
(*b*) Dilatation of anus and absence of puckering of anal *introitus*, in habitual cases ;
(*c*) An infundibuliform-shape of the anal *introitus ;*
(*d*) The presence of old lacerations, as indicated by cicatrices.

But without condescending upon details, this unnatural crime may be committed in other ways which leave no such lesions behind them, and consequently in many cases the crime either goes undetected, or fails in being established for want of evidence. Where an offence is established, it is usually by the evidence of persons not medical.

Of Bestiality little need be said, since in most of the cases the culprit is caught in the act, and therefore there is no need for medical opinion. Any evidence of a medical kind must either be supplementary to that of eye-witnesses, or be purely circumstantial. When of the latter form, it usually consists in finding upon the person of the accused evidences of contact with the animal, as hairs, etc., which correspond with those of the animal in question.

CHAPTER XV.

DIFFERENTIAL DIAGNOSIS OF STATES OF INSENSIBILITY.

THERE is no part of the work of the divisional surgeon of police, or of the medical practitioner who may be called by the police, more difficult than the diagnosis of the cause of insensibility of persons who are either brought to the police station or are found in the public streets in an unconscious condition. "Drunk or Dying" is a favourite head-line of the morning newspaper, under which are recorded the facts of a case in which a man has been apprehended on the charge of being drunk and incapable, but who has been found to be suffering from fracture of the skull, or other causative factor of partial or complete unconsciousness.

From what causes may this condition of partial or total unconsciousness arise? It may be due to (*a*) Natural disease, as apoplexy, epilepsy, embolism of the brain, uræmia, or an ordinary attack of syncope; (*b*) Accident, producing fracture of the base of skull, or concussion of the brain; (*c*) The effects of poisons, such as opium, belladonna, or alcohol.

In order to ascertain the cause, the examiner will naturally inquire concerning the history of the case, and where such is obtainable, it is most helpful in many of them. But unfortunately it too often happens that there is no further history forthcoming than that the person was found unconscious. Under the latter circumstances, therefore, an opinion can only be arrived at by a process of exclusion, and by a careful balancing of all the evidence.

(A) **Causes of Insensibility due to Disease.**

We must therefore review, first of all, what are the characteristics of those states of insensibility which proceed from natural disease, and which are more or less rapid or sudden in their onset.

I. *Apoplexy.*—The points to be noted are the following, viz.:—

(*a*) It generally occurs in persons above the age of forty;
(*b*) It more frequently happens in men than in women;
(*c*) Its onset may take place under any circumstances;
(*d*) The symptoms begin somewhat abruptly—the person may fall suddenly to the ground, or collapse in his seat if he be sitting—and unconsciousness, more or less complete, quickly supervenes;
(*e*) The symptoms comprise the following: A pale or flushed face; stertorous breathing; the facial muscles will be drawn to one side, which is that opposite to the paralysed side; there is hemiplegia, usually: the pupils may vary in condition; they may be unequal, or they may both be abnormally contracted, where the cerebral hæmorrhage is extensive in area, or if it be situated in the *pons Varolii;* the temperature at first may be sub-normal, but later it rises above the normal.

With respect, however, to the age of onset, the examiner must be on his guard owing to the fact that in rare instances apoplexy may come on at an unusually early age; for example, a case is recorded[1] in which a lad of sixteen died from extensive cerebral hæmorrhage. Besides, it may supervene in a prolonged epileptic attack in those comparatively young.

II. *Epilepsy.*—Insensibility, lasting for a variable period, always succeeds the convulsive stage of an attack of epilepsy—*grand mal*—and it is generally profound while it lasts. Should the person be seen before the conclusion of the convulsive seizure, or should the information be obtainable from an intelligent eye-witness, the examiner will receive help in his diagnosis. The points in its natural history to be noted are these:—

1. It occurs at all ages, and it is expressive of different causative conditions;
2. Immediately after the convulsive stage of attack, the face and lips are more or less livid; there may be bloody froth at the mouth; the tongue may be found more or less severely lacerated from having been bitten, or cicatrices from former lesions may be found thereon;
3. The pupils are dilated during the convulsive stage and for some time thereafter;
4. The element of time will clear up the diagnosis, by the person gradually returning to consciousness, unless cerebral hæmorrhage has supervened.

The dilatation of the pupils is a valuable means of detecting the professional mendicant who trades upon the sympathies of unskilled onlookers by simulating a fit, for though he may imitate fairly closely the convulsive features of the attack, and even produce frothing at the mouth by a piece of soap artfully concealed between his cheek and gum, he cannot at will dilate his pupils when his eyelids are shut.

III. *Embolism of the Brain.*—This attacks also the young and old. A person apparently in good health, in making a little more than usual exertion, falls suddenly to the ground in a semi-unconscious state which may gradually deepen into almost total insensibility. The points to be noted are these:—

1. Sudden onset of unconsciousness, at first not so marked as later;
2. In the young, a rough cardiac murmur—usually mitral—may be found on examination, indicating rheumatic endocarditis;
3. Hemiplegia of right side of body, because of blocking of left middle cerebral artery;
4. In the old, there will be evidence of atheromatous or calcareous degeneration of arterial coats, best seen and felt in temporal artery, and in the brachial artery at inner side of arm just above elbow.

IV. *Uræmia.*—This condition is most usually found in elderly persons, or those who have reached middle life. Points to be noted are as follow:—

1. Age of person;
2. Evidence of anasarca, of œdema of feet, or puffy, relaxed, or pouchy appearance of skin of lower eyelids;
3. Signs of enlargement of left heart, and thickening of internal coats of main arteries;
4. *Pupils are much contracted;*
5. Examination of urine will likely reveal the presence of albumen.

[1] *B. M. J.*, vol. i. 1896, p. 785.

^ the only positive sign, when the fracture involves the foramen magnum is ecchymosis of the posterior wall of the pharynx.

V. *Hysteric Coma.*—The manifestations of hysteria in women are most varied, and occur sometimes from the most trivial causes. The characters of an attack are these:—

1. The woman throws herself to the ground, and her body is thrown into convulsive movements of a markedly *inco-ordinate* character, and foam often appears at the mouth;
2. On the cessation of the convulsive stage, unconsciousness supervenes;
3. According to Charcot—who denominates this hystero-epilepsy—the temperature during a fit rises only one or two degrees, while in real epilepsy it rises from five to six degrees;
4. After a variable time consciousness returns, which may be expedited by gently compressing the nostrils between the finger and thumb and covering the mouth with the flat of the hand for about 30 seconds, so as to prevent respiration.

VI. *An ordinary Faint.*—This is comparatively common in crowded places of resort and in public places, and its appearances are so familiar and so evanescent that they need not be discussed. Syncope, however, in elderly persons is a much more serious affair, and is characterised, in addition to partial unconsciousness, by a weak, irregular, and almost imperceptible pulse. Such conditions should never be regarded lightly, especially in elderly persons, and prompt measures must be taken to stimulate the heart, and by postural treatment, to restore the function of the brain.

(B) **Insensibility or Unconsciousness arising from Injuries.**

I. *Fractures of the Skull, especially of the Base.*—The history of a case in this connection is all-important, but it is often awanting. Evidence of the presence of fracture will likely be found in the following particulars:—

1. The presence of marks of violence on the scalp, and depression of part of vault of skull;
2. Complete unconsciousness;
3. The presence of the following signs, viz.: hæmorrhage into the orbit or conjunctiva, or free bleeding from the nose, where the fracture is situated in the *anterior* fossa; bleeding or the escape of a serous fluid from one or other ear, from fracture of the petrous portion of the temporal bone, where the fracture of the base is in the *middle* fossa; absence of the foregoing external signs, in fracture limited to the posterior fossa;
4. The condition of the pupils varies in different cases;
5. The temperature is, at first, subnormal;
6. There may, or may not be, hemiplegia.

II. *Concussion of the Brain.*—This condition also follows injury.

1. The patient is partially or completely unconscious. If the effects be due to pure concussion only, the patient will likely be able to be roused; but if laceration of the brain substance and accompanying hæmorrhage be present, the coma will be profound;
2. Symptoms of shock are present. The body is cold, face is pale, and the temperature is sub-normal;
3. The pupils are usually contracted, but mobile.

The examiner must be careful to remember that injury may produce laceration of brain and hæmorrhage without any external lesion being found on the head, except upon careful and deliberate examination.

(C) **Insensibility due to Poisoning.**

I. *Opium.*—It depends at what stage of the case the person is found what the symptoms will be; for example, shortly after the taking of the poison the patient may be roused; later, however, that will be impossible, because of the profundity of the coma.

Symptoms are as follow:—

1. The patient is either somnolent but capable of being roused, or deeply comatose and unable to be roused;
2. The pulse is either full and bounding, or slow and weak;
3. The face is either flushed, or pale, and the lips livid;
4. *The pupils are markedly contracted and immobile;* indeed, the contraction may be to the size of a pin-head; or one pupil only may be contracted, and the other irregular in shape or more or less normal in size, due to old eye-disease;
5. The temperature, normal at first, becomes sub-normal in the later stages;
6. The breath may, or may not, have the odour of opium, depending upon the preparation which has been taken.

II. *Belladonna.*—This form of poisoning is more rarely seen than that of opium or alcohol; but its symptoms are fortunately characteristic. They are these:—

1. The patient is more or less unconscious, but may at first be roused;
2. *The pupils are widely dilated and immobile;*
3. The face is flushed, the eyes appear staring, and they give the person a startled appearance;
4. There is fussy, rambling muttering, or even more excited delirium, which, in odd cases, becomes almost maniacal;
5. The utterance is thick and often inarticulate, because of the parched condition of the mucous membrane of mouth;
6. The temperature continues normal until the further stages, when it becomes hyper-normal.

III. *Alcohol.*—Abuse of alcohol is probably the most common cause of coma in police practice; "dead drunks" are comparatively common. The casual observer may erroneously conclude that alcohol is the cause of the unconsciousness from observing the odour of alcohol in the breath of the patient, while it is simply due to the fact that a sympathetic bystander has attempted to administer some stimulant to the unconscious person. Indeed, our experience is that a marked odour of alcohol from the person is rather an indication of a more serious cause of the unconsciousness than otherwise, because the odour of alcohol, as such, is not so often perceivable after an interval of time as is commonly believed. This we affirm from fifteen years' observations. In 1876, the late Sir Benjamin Ward Richardson in his Cantor Lectures on "Alcohol" devoted himself to the consideration of points of difference in the diagnosis between alcoholic poisoning and apoplexy, and he affirmed, as a general distinction, that in the former the temperature was sub-normal, and in the latter it was hyper-normal. He therefore thought that the two conditions might be distinguished by thermometric observation. As a matter of fact, however, sub-normal temperatures are found in apoplexy (at first), and in opium poisoning, as well as in alcoholic poisoning. The temperature of alcoholic poisoning is well illustrated by a series of fifty cases taken as they came into the police station and recorded by Macewen.[1]

[1] *Glasg. Med. Jour.*, Jan. 1879.

Temperature of Alcoholic Poisoning.

Fifty Cases.

Number of Observations.		Temperature in Rectum.
2	at	98·2°
14	from	97° to 97·9°
15	,,	96° to 96·9°
12	,,	95° to 95·9°
5	,,	94° to 94·9°
2	at	93·4°

We have found sub-normal temperatures constantly in "dead drunks," occasionally in cases of apoplexy, and, not infrequently, in cases of opium poisoning; hence we are bound to conclude that the thermometric test alone cannot be relied upon for diagnosis.

But the behaviour of the pupils, as shown by Macewen, and which has been confirmed by the author,[1] is a sign which can be relied upon. If we take up a series of authors who treat of this subject, we shall find that some[2] declare that the pupils are contracted in alcoholic poisoning, and others that they are dilated. Both are partly right and partly wrong, in respect that the pupillary condition depends upon whether the sufferer has been lying undisturbed or not for a time. If an alcoholic person, completely unconscious, be allowed to lie unmolested for half-an-hour, and his pupils be then examined, they will be found *contracted*, but if any external stimulation be applied to the body, such as moving the person, pulling the hair of his face, or slapping him, the pupils will be seen to gradually *dilate*, while he remains all the time completely comatose; then if he be allowed to lie quiet again for ten, fifteen, twenty, or thirty minutes—for the time differs in different cases—the pupils will be found to have returned to their originally contracted condition. It is this contraction and dilatation which is the characteristic pupillary condition of alcoholic cases, and, moreover, it is one which differs so much from those states of unconsciousness in which the pupils are contracted and fixed, or dilated and fixed, that it becomes a most valuable factor in diagnosis. Personally we have used this test from 1878, since it was indicated to us by Macewen, and we have not found it to fail in normal circumstances. The only conditions in which it does not respond are where from previous operation, or disease, the pupil has been altered in shape, or has become fixed from adhesions in iritis. *The Lancet*,[3] commenting upon the statements of Macewen, concluded by saying that "the test must have a larger trial before it can be finally accepted." That has been applied by the author during a police practice of some eighteen years, and has been found absolutely reliable, in cases of pure alcoholic coma. Our experience, however, includes several peculiar cases of combined causes, such as alcohol and apoplexy, alcohol and fracture of the skull, alcohol with epilepsy, and

[1] *The Lancet*, 1879.
[2] Woodman and Tidy, *op. cit.* p. 498; Guy and Ferrier, *op. cit.* Fifth Edit. p. 546.
[3] Vol. ii. 1878, p. 709.

alcohol with uræmia, all of which disturbed the usual incidence of the pupillary phenomenon. A correspondence commenced in *The Lancet* in January 1879, in which various writers expressed their dissatisfaction with the statements of books on this subject,[1] and in which we took part. Hughlings Jackson[2] records a case in which a man, aged 21, was known to have imbibed "a vast quantity of intoxicating liquor." He was profoundly unconscious, and his pupils were contracted to the size of a pin's head. In this case it was observed that "pulling the ear and hair of the left side of face dilated both pupils, and that, at the same time, the face became flushed." In this connection the following references may be consulted:—

Med. Times, vol. i. 1878, p. 630.—Observer—Dr. George Johnson.
The Lancet, vol. i. 1868, p. 589.
B. and For. Med. Chir. Review, vol. ii. 1867, pp. 261–2—Mitscherlich.
Idem, p. 317.
Ranking's "Abstract," vol. i. 1859, p. 35.—Richarz of Endernich.
Med. Times, vol. i. 1871, p. 360.—Hughlings Jackson.
Idem, 1868, p. 498.
Idem, vol. ii. 1860, p. 236.—Cooper Rose.

The examiner must also take note of any evidences of Carbolic Acid poisoning, which rapidly produces unconsciousness, because of its adoption as a favourite suicidal poison. (*Vide* Carbolic Acid.)

The main objects of an examination in cases of Insensibility are twofold: (1) to arrive at a diagnosis so that appropriate treatment may at once be employed; (2) to put the patient in the best conditions for recovery, by removal to an available hospital or other suitable place where the symptoms may be closely watched. In all cases of doubt, the latter course, when possible, is the best and safest for all concerned. The following particulars ought to be attended to in the examination of an unconscious person, viz.: (*a*) Condition of pupils; (*b*) Age of the person; (*c*) Bodily Temperature; and (*d*) Progress of the Symptoms.

As a preliminary point in this examination, it is advisable to permit the sufferer to remain in perfect quiescence for at least a few minutes before examining the pupils.

A. The pupils may be found (*a*) normal, (*b*) both contracted, (*c*) both dilated, or (*d*) variable, that is, one contracted and the other dilated. It is important to note that the size of the pupil even in healthy subjects varies; some have smaller pupils than others; consequently, contraction or dilatation is a comparative condition. Next, the mobility or immobility of the pupils to light should be noted. If the pupils are normal in size, note the presence or absence of conjunctival reflex, find if the person can be roused, and if partially so, what is the mental condition when roused.

I. If the pupils are contracted, then we know that the insensibility may arise from:—

1. Concussion of brain;
2. Opium poisoning;
3. Alcoholic coma;
4. Uræmia;

[1] Gale, *The Lancet*, vol. i. 1879, p. 35.
[2] *Med. Times*, vol. i. 1876, p. 498.

/ Haemorrhage / Varolii

5. Apoplexy into the *pons Varolii*;
6. Physostigmin poisoning.

(A) Where the pupils are much contracted and immobile :—

(*a*) Opium poisoning;
(*b*) ~~Apoplexy~~ into *pons*;
(*c*) Uræmia;
(*d*) Physostigmin poisoning :—

(B) Where the pupils are contracted, but are mobile on stimulation of person :—

(*a*) Alcoholic poisoning.

II. If the pupils are widely dilated :—

1. Belladonna or Atropin poisoning;
2. Epilepsy (comatose stage);
3. Uræmia (late stages);
4. Apoplexy;
5. Impending asphyxia.

III. If one pupil is contracted and the other dilated (note whether any disease of eye is apparent).

1. Fracture of Skull (localised);
2. Previous disease of eye (fixation of iris).

B. The Factor of Age may be of guiding value. As has been already indicated, apoplexy and uræmia are usually present only in persons in late adult life; epilepsy and embolism or thrombosis of brain, at any age; and poisoning by opium or belladonna, fractures of skull, or concussion of brain, also at any age. Apoplexy may be verified by the presence of hemiplegia, and the distorted appearance of the face; uræmia, by the presence of limited dropsy, thickening of arteries, high tension pulse, and albumen in the urine; epilepsy, by the bloody froth at mouth, or evidences of cicatrices on tongue; embolism of brain in the young, by the presence of hemiplegia, and a rough mitral murmur. Injury to the skull or brain, or concussion of brain, may be suspected by the presence of evidence of injury on the scalp, which may not, however, amount to more than contusion, although there may be conjunctival ecchymosis, free bleeding from the nose, or from one ear.

C. Take the temperature of the body *per rectum*. This, while it may afford good evidence of the gravity of the case, will not of itself enable us to differentiate between causes.

D. The factor of time is very valuable. In some cases, prompt action must be taken, in others no harm will arise from delay, provided the person, in the meantime, is being carefully watched in a room with a temperature of from 60° to 70° F. It is not bad practice in cases of doubt to wash out the stomach with the syphon-tube, because, while it will do no harm to the patient in any case, it may give early evidence of the use of poison by the odour of the washings. This element of time will, of itself, clear up a case of epileptic or hystero-epileptic seizure, many cases of concussion, and, also, of alcoholic coma. Where the pupillary conditions point to the likely use of opium, belladonna, or alcohol, the appropriate treatment is to freely wash out the stomach until the washings return clear and odourless, and, thereafter, in the case of opium, to keep the patient wakeful, and in the case of alcohol,

to wrap him in blankets, and place him on a mattress before a good fire, in order to restore the animal heat and induce perspiration. For the further details of treatment of persons poisoned with these substances, we must refer the reader to the section of this book dealing with Toxicology.

In every case of doubtful or difficult diagnosis, the patient, we repeat, ought if possible to be removed to hospital, or be kept under close, unremitting, medical supervision; for, after all, there is no more perplexing duty than the differential diagnosis of these states of unconsciousness, as the following cases taken at random from our case-book will indicate.

I. A. C., an elderly man, brought to the Police Station, was examined at 5.45 P.M. He was unconscious—did not respond to ordinary stimulation; pupils were contracted to size of pin's head, and were fixed; pulse, 84; he was very cold and tremulous; temperature sub-normal. After some time, he was roused sufficiently to drink some hot tea, to which, ultimately, he was able to help himself, although he tended to lapse into somnolency. He remained lying in blankets in front of a fire, and for some hours could be easily roused. At 10 P.M. he again became unconscious; the pupils again became contracted; the breathing became stertorous and Cheyne-Stokes in character; and the pulse irregular and weak. By this time discoloration had developed over left cheek and left eye-lid, with slight swelling of upper right eyelid. On account of his weak condition, we remained beside him from 10.30 P.M. till 2.15 A.M. At 1.30 A.M. his urine was drawn off, and was found free from albumen. He remained unconscious till about 8 A.M., when consciousness partly returned. At 10.50 A.M., when he was shaken and spoken loudly to, and was asked if he were thirsty, he replied, "Yes, sir!" and took a drink. He again lapsed into unconsciousness, was sent to the Town's Hospital, where he died, never having regained consciousness. During the time he was conscious, he informed the police that he had come in from the country that afternoon with some weeks' wages in his pocket, that he met two men who invited him into a spirit-shop to have a drink, that he had porter, and that on coming out he began to feel "queer," and that he remembered nothing in the interval. His money was all gone. He was found in this insensible condition in a back close in a street not far from where he had the drink. The opinion we formed of his condition was that he had been drugged by opium, that this was succeeded by manifestations of uræmia, although no albumen was found in the urine, and that he ultimately died of apoplexy. No post-mortem examination was made.

II. H. D. *ætat* 38, insensible. On examination of eyes, the right was found atrophied and shrunken, while the left gave the alcoholic reaction. He was kept warm and watched. He recovered.

III. H. M., *ætat* 23, was examined at 7.10 P.M. She was completely unconscious. The pupils were moderately dilated and fixed. At 8.30 P.M. pupils were found contracted but to dilate on stimulation, again contracting after twelve minutes. This case was puzzling until her mother, who found her in the police station, stated that she was an epileptic with a strong craving for drink, which she satisfied whenever she could. She was found in a back court. The combination of epilepsy and alcoholic coma accounts for the strange behaviour of the pupils.

IV. A. P., *ætat* 36, was brought to the station at 6 P.M., for breach of the peace. At 8 P.M. she was seen by the officer on duty to be quite right. At 10.20 P.M. she was found unconscious in her cell, and there was no response to stimulation. On examination, the pupils were found much contracted and immobile. She was evidently suffering from opium poisoning. Her clothing was minutely searched, but no phial, or packet was found on her person. As her breathing was regular and the pulse good, instructions were given that she should simply be watched. As there was a protected fire burning in the cell, instructions were further given that the ashes should be carefully examined in the morning, which, on being done, revealed a half-ounce phial. She confessed that she had swallowed twopenny-worth of laudanum shortly after the officer

had visited her cell at 8 P.M., and that she had thrown the phial in the fire thereafter.

V. J. H., *ætat* 42, was found insensible on the street. The right ear and right cheek were swollen and ecchymosed; there was a contusion about 1½ inches in diameter in left temporal region, and blood was issuing from the left ear. The pupils were normal and sensitive to light. He was removed to hospital where he died next day.

VI. W. M., *ætat* 30, found in back court deeply comatose. Alcoholic pupils. Stomach washed out, gave odour of methylated spirit. He recovered. Confessed to being a confirmed methylated spirit drinker.

VII. VIII. IX. In each of these, one pupil was dilated to double the extent of the other, and in each case there was evidence of head injury by wound or contusions found upon scalp.

These cases, taken at random, indicate the problems which have to be dealt with, and the foregoing chapter is intended merely to be helpful to students in their diagnosis; for all who have had any experience in dealing with such cases know the great difficulty, indeed, the impossibility, sometimes, of being able at once to arrive at a conclusion. Indeed the main object of the chapter is to warn the young practitioner against hasty diagnoses.

CHAPTER XVI.

LUNACY IN ITS MEDICO-LEGAL ASPECTS.

While the practitioner of medicine is not expected to be as familiar with the law of lunacy as the practitioner of law, it is necessary for his own intelligent and legal action that he should be familiar with those parts of it at least, by which his own relations to the person of unsound mind are regulated, and moreover, should have such a general knowledge of procedure that he may advise his clients in a general way how to initiate procedure. His relationships with the public will doubtless bring him sooner or later into close contact with cases of idiocy, of inebriety, or forms of lunacy or mental unsoundness, out of which he may be required: (1) to certify as to mental unsoundness; (2) to pronounce an opinion regarding the testamentary capacity of persons; (3) to pronounce an opinion as to the ability of a prisoner to give instructions to counsel for his defence or to plead to a given charge, by reason of mental unsoundness; and (4) to certify in other contingencies, such as in the appointment of a curator to an estate, the holder of which is of unsound mind.

Before considering these, it will be necessary to discuss the law of the subject, in order that an intelligent conception of duty may be attained.

I. *Laws as to Lunacy in Great Britain and Ireland.*

A. England. The Acts of Parliament which deal with lunacy in England, are the following:—

47 & 48 Vict. cap. 64 (1884).
49 & 50 Vict. cap. 25 (1886—Idiots and Imbeciles Act).
53 & 54 Vict. cap. 5 (1890).

B. Ireland—

30 & 31 Vict. cap. 118.
38 & 39 Vict. cap. 67 (1875).
49 & 50 Vict. cap. 25 (1886).
53 & 54 Vict. cap. 31 (1890).

C. Scotland—

25 & 26 Vict. cap. 54, sect. 14 (1862).

D. Common to England, Scotland, and Ireland—

The Inebriates Acts.
42 & 43 Vict. cap. 19 (1879).
51 & 52 Vict. cap. 19 (1888).
61 & 62 Vict. cap. 60 (1898).

The three Acts to be construed together.

It will clear the ground if we dispose first of all of the Idiots Act (49 & 50 Vict. cap. 25). An idiot or imbecile is one whose

mental condition is defective only in a simple respect without active insanity, which defect has either existed from birth, or from a point of time shortly thereafter. If such a person is to be put under care, he must be placed in an institution which is registered for the purpose under the above Act. His reception must be accompanied by:—

(1) A medical certificate which bears that the person therein named is an idiot, or an imbecile, from birth, or otherwise, and one who is capable of receiving benefit from the care of the institution into which he is to be received; (2) a statement by the parent or guardian, or other person who is charged with the duties of such relationship, respecting his condition. No judicial order of any kind is required. After admission, the person may be retained in the institution, with consent of the Commissioners in Lunacy, until he has attained full legal age.

PROCEDURE IN ENGLAND RESPECTING LUNATICS.

Procedure for the Detention of a Private Insane Person in an Asylum.

This is to be found in the Lunacy Acts of 1884 and 1890, with relation to England. The procedure depends upon certain circumstances, viz.:—

(*a*) Whether the person is living in family with his friends;
(*b*) Whether the person is not under proper care or control;
(*c*) Whether the person is being cruelly treated or neglected by his relatives or those in charge of him;
(*d*) Whether the person is wandering at large.

(A) **Procedure where the person is living in family with his friends.**

There are three ways in which his detention may be effected, viz.:—

(1) By Judicial Order on Petition;
(2) By an Urgency Order;
(3) By an Inquisition in Lunacy.

I. *By Judicial Order on Petition.*

The first is the mode most commonly adopted. This essentially consists in presenting to the proper judicial authority the following documents, viz.:—

I. A petition by the wife or husband, or parent, or other relative of the person named; if by any other person than a near relative—where nearer relatives are living—then the reasons why it is presented by the signator and not by the nearer relative must be stated in the petition. The petition must contain all the particulars necessary, viz.:—

1. (*a*) Full name; (*b*) age; (*c*) occupation; (*d*) postal address of petitioner;

2. (*a*) Full name; (*b*) address; (*c*) occupation of insane person;

3. Relation of signator to insane person; or if no relation, the reasons for signing petition;

4. A declaration that signator is not related to, or connected with either of the persons signing the certificates of lunacy, in the relationships of husband, father, father-in-law, son, son-in-law, brother, brother-in-law, partner or assistant; or, in the case of a female signator, in the opposite relationships.

5. An undertaking that petitioner will visit insane person by himself or herself, or by some one appointed for the purpose, once every six months while under charge.

"The proper judicial authority" for this purpose may be (*a*) a County Court Judge; (*b*) a Stipendiary Magistrate; (*c*) a Justice of the Peace "specially appointed" by his brother magistrates "for this purpose."

II. A Statement of Particulars with reference to the history and condition of the insane person; if the said insane person has already been received into an asylum under an urgency order, the date on which the order was presented must be given.

III. Two Medical Certificates.

In each certificate (*a*) the name, designation, and address of the person must be given; (*b*) a declaration that the signator is a registered medical practitioner; (*c*) the date upon which his examination was made, and the address at which it was made; (*d*) a statement of facts indicative of insanity observed by the signator at that examination; (*e*) similar facts observed by others, whose full description must be such that their identity may easily be established; (*f*) a statement of the bodily health of the insane person, with reference to fitness for removal; (*g*) a declaration that the signator has first read Section 317 of the Lunacy Act, 1890, before granting the certificate; (*h*) the date of signature, signature itself, and the address of the signator.

IV. The Reception Order, which is signed by the Judicial Authority, who, before signing, must—

(*a*) Be satisfied with the evidence in the medical certificates;

(*b*) Or, appoint a day within 7 days of the presentation of the petition for the consideration thereof; at which diet he may, however, adjourn consideration until some subsequent day, but within 14 days of the date of the presentation of the petition; or, he may

(*c*) Visit the alleged lunatic; or,

(*d*) May refer consideration of the petition to another judicial authority.

If the Reception Order be signed, then it is a sufficient Order to detain the patient in the place named in the Order, and to allow of such steps being taken as are necessary, in the way of constraint, for his removal to said place.

Should, however, the Judicial Authority be dissatisfied with the evidence of insanity and dismiss the Petition, then the Petitioner must, in order that procedure should begin *ab initio* :—

1. Make out a new petition, stating in it that a previous petition had been dismissed, and the reasons for said dismissal; and
2. He must procure from the Lunacy Commissioners "a copy of the statements sent to them of the reasons for dismissing the previous petition," and send this with the new petition.

Omission to do this is a misdemeanour according to section 7 sub-section 4 of the Act.

II. *By Urgency Order.*

This method is adopted where, either for the welfare of the alleged lunatic, or for the public safety, it is expedient to place forthwith the insane person under care and treatment; or where the previous method is difficult to carry out. The Urgency Order must be signed by a near relative; it must be accompanied by a Statement of Particulars, and by one medical certificate. The Order may be signed before or after the medical certificate, and it may be made after or before a petition for such an Order is presented; if made *before*, the fact must be stated in the petition; if after the petition has been presented, a copy must be sent forthwith by the petitioner to the Judicial Authority. An urgency order remains in force for 7 days, or until the petition is finally disposed of. The qualified medical practitioner who signs the certificate must have examined the alleged insane person within two clear days before.

III. *By Inquisition.*

This method is had recourse to where there is difficulty anticipated in dealing with the property of the insane person. The original procedure by this mode was slow, cumbrous, and expensive; now, it is possible of achievement, by virtue of the Lunacy Act of 1890, by a much easier, more rapid, and less expensive process, as all the necessary powers for granting to any named person full control over the property of any lunatic or person of weak mind, either from disease or age, are vested in a Judge of Lunacy.

(B) **Where the person is not under Proper Care, or Control;**

(C) **Or is cruelly treated or neglected.**

The duty of reporting such a case falls upon any constable, relieving officer, or overseer of any parish within 3 days of his knowledge of the fact of the person's insanity. The Report must be *made on oath* to a "justice of the peace," who is a "judicial authority" under the Act. The justice shall then direct two medical men to visit and examine the alleged lunatic; and otherwise shall proceed as if the information on oath were a petition for a Reception Order. Upon the certificates of the medical examiners being received by the judicial authority, he shall, if satisfied with the evidence of insanity, make an order for removal of the lunatic to a duly recognised institution.

(D) **Where the lunatic is "wandering at large."**

In this contingency, the like procedure to that in (B) and (C) is followed.

The following general remarks are applicable to the foregoing: Should the relatives, after the detention of the insane person in a given institution desire his removal from that institution to their own keeping, or to another institution, the following are the steps necessary to be taken, viz.:—

1. To apply to the visitors of the asylum in which the patient is residing, for permission to take the patient under their own charge;
2. To apply to the Commissioners of Lunacy for consent to remove the patient to the other institution named by them.

Or the relatives may, if they appear at the inquisition of lunacy held by the Judicial Authority, receive an Order from said authority to have the patient placed under their own care.

Differences in Procedure between Pauper and Non-Pauper Lunatics.

The procedure in the law of England in obtaining the detention of a pauper patient differs in certain points which must now be mentioned, which, for convenience of comparison, are put in parallel columns.

Pauper Patient.	Non-Pauper Patient.
1. Proceedings are initiated by a relieving officer, or overseer of a parish, by notice to a Justice of the Peace.	1. By relatives, by petition to a Justice of the Peace, who is a "judicial authority" in terms of the Act.
2. The Justice may cause the patient to be brought before him, or he may visit the patient, but he *must* examine the patient personally.	2. The Justice cannot cause the patient to be brought before him, but may visit him. He is not required to examine him personally.
3. One medical certificate only is needed, given by a qualified medical man named by the Justice for this purpose.	3. Two medical certificates are required, given by medical men called by the relatives or friends of the patient.
4. The execution of the Reception Order may be suspended for 14 days by the Justice, and, upon a medical certificate of the unfitness of the patient for removal, for any indefinite time.	4. The Reception Order remains in force for 7 days only; if the patient be not taken into the asylum within that period, it becomes *invalid.*

Voluntary Patients.

Persons may voluntarily desire their own retention in an Institution to protect themselves against the risk of an attack of mental illness which they feel, or may think, is impending. In such cases, they must apply to the Commissioners in Lunacy, or to two Justices, for permission to enter an asylum which is named, as a voluntary patient.

PROCEDURE IN SCOTLAND.

The Act which regulates procedure in lunacy in Scotland is 25 & 26 Vict. cap. 54 (1862), which is entituled "An Act for the Regulation of the Care and Treatment of Lunatics, and for the Provision, Maintenance, and Regulation of Lunatic Asylums in Scotland."

The schedule which is in use under this Act for taking the necessary steps for the detention in an asylum, and which, moreover, remains in the keeping of the superintendent of the asylum after the order for detention has been granted by the Sheriff, consists of the following distinct parts, viz.:—

I. The Petition to the Sheriff or his Substitute by the near relative of the alleged insane person, for authorisation to convey the alleged person to a given asylum, the date of which Petition must be within 14 clear days following the dates of the medical certificates.

II. The Statement of Particulars regarding the patient, which must be signed by the petitioner;

III. and IV. Medical Certificate (No. 1), and Medical Certificate (No. 2), which must bear the following statements:—

(*a*) Declaration of the name, medical qualifications, and address of the signator, and of the fact that he is in actual practice;

(*b*) Certification on *soul* and *conscience* that the signator on the date and at the place given, personally and separately from any other medical practitioner, examined the person named in the certificate, and that he is of opinion that the person named is of unsound mind and ought to be detained under care and treatment;

(*c*) A statement of the facts indicative of insanity which the signator himself has observed in the patient;

(*d*) Other facts indicative of insanity which have been communicated to the signator by others, whose names, designations, and addresses are fully given, so that their identity may be easily established;

(*e*) The signature, medical qualifications, and address of the signator, and date of signature.

V. The Order of the Sheriff for transmission and reception of the Lunatic, in which that judicial authority sets forth,

1. His name and judicial office;
2. The fact that a petition and medical certificates have been produced to him which state that the alleged lunatic is of unsound mind, and that he ought to be detained in an asylum;
3. Order for detention of the person named;
4. Date; and signature of Sheriff.

This order is addressed to the superintendent of the asylum, named in the order, in which the person is to be detained under care and treatment.

In Scotland, the alleged lunatic, in cases where there are risks to his own safety, or to that of the public, may be committed upon *one* medical certificate—the Certificate of Emergency as it is termed—which authorises the detention of a patient in an asylum for a period not exceeding 3 days without an order from the Sheriff. The procedure in pauper and non-pauper cases is essentially the same, except that in the former it is initiated by the poor-law authorities. In the case of a lunatic "wandering at large," the Procurator-Fiscal initiates the procedure for his detention by instituting an inquisition in lunacy before the Sheriff, and the lunatic is committed upon the certificates of two medical practitioners who have been named by the Sheriff on petition of the Fiscal.

Incipient and Unconfirmed Insanity.—The law with respect to the keeping in private unregistered places of persons suffering from incipient, ill-defined, and unconfirmed insanity, differs materially in Scotland from that of England. In England, no one can take charge of any alleged lunatic or person of unsound mind except by virtue of an order by a judicial authority. By section 315 of the English Act of 1890, any one who does this without an Order shall be deemed guilty of a misdemeanour, and is liable to a penalty not exceeding £50. This would seem to include such persons as hysterical women, drunkards, eccentrics, and other persons on the borderland of insanity. In

Scotland, on the other hand, by clause 41 of the 25 & 26 Vict. cap. 54, such persons may be put under care in private houses. In March 1899, a deputation of English alienists waited upon the Lord Chancellor to state the hardships of this part of the English law, particularly as several harassing prosecutions had been made against medical practitioners who kept one or more "queer" persons as boarders. The Lord Chancellor said that he was entirely in sympathy with the clause of the Scots Act, although he thought the period of six months named therein to be too long. In respect of cases of non-confirmed insanity, he was quite with them as to their suggested alteration of the law, and he would try to give effect to their suggestions. Section 315 of the English Act which controls the keeping of cases of unconfirmed insanity reads as follows:—

"(1) Every person who, except under the provisions of this Act, receives or detains a lunatic, or alleged lunatic, in an institution for lunatics, or for payment takes charge of, receives to board or lodge, or detains a lunatic, or alleged lunatic in an unlicensed house, shall be guilty of a misdemeanour, etc. (2) Except under the provisions of this Act it shall not be lawful for any person to receive or detain two or more lunatics in any house unless the house be an institution for lunatics or a workhouse. (3) Any person who receives or detains two or more lunatics in any house, except as aforesaid, shall be guilty of a misdemeanour."

From this section, as it stands, no person—medical or other—is entitled to keep for payment any lunatic or alleged lunatic. Therefore, medical practitioners who do this, do it at the risk of prosecution, of which several cases which have already occurred may be cited. Possibly the outstanding case is that of R. *v.* Reichardt,[1] in which the defendant—a medical man—was charged with contravening the above section of the Act, inasmuch as he had kept under his care and treatment a lady who had formerly attempted to commit suicide by poison, and who, moreover, while in Dr. Reichardt's care, escaped from a window and deliberately drowned herself. This was a warning case, and a verdict was returned for the defendant. In another case, the prosecution obtained a verdict against a male nurse who was taking care of a young man who was said to be of unsound mind;[2] and in a third case a medical man was likewise charged on three actions of the same kind, and had to pay £10, 10s. toward the cost of the first action, and the court fees of the others, which were withdrawn.[3]

PROCEDURE IN IRELAND.

This is regulated by similar provisions to that of England, although laid down in different Acts of Parliament, and consequently, it need not be detailed further.

MEDICAL CERTIFICATES OF LUNACY.

From what has preceded, it will be obvious that the medical certificate plays the most important part in a petition for the detention of an idiot or an imbecile, or of a lunatic or person of unsound

[1] *B. M. J.*, vol. i. 1899, Jan. 14. [2] Idem, vol. ii. 1898, Dec. 17.
[3] Idem, vol. i. 1900, p. 1322.

mind; indeed, without it, a successful petition, as the law stands, would be impossible; it is, in short, the pivot upon which the whole process turns. Since, then, the power of committing to an asylum a person alleged to be insane rests in the hands of the medical practitioner, it behoves each member of the profession not only to make himself conversant with the signs and symptoms of insanity and other allied mental conditions, but also to exercise this duty in the most conscientious and painstaking manner. From the absence of the appearance of sufficient care in certification, medical men have had law-suits brought against them, and, in some cases, have been cast heavily in damages where the plea of wrongous committal on the strength of certificates given by them has been attempted or made. It is only necessary to give two cases to illustrate the risks to which members of the medical profession were exposed before the passing of the Act of 1890, viz.:—

(1) Weldon *v.* Semple, 1878; and (2) Mrs. X. *v.* Drs. Whittle and Hutchinson, and Mr. Mould, 1884.[1] Since in both of these the mode of certification and the relevancy of the certificates were in question, they will serve as illustrations of points to be discussed in the text.

The facts of Weldon *v.* Semple are, briefly, these:[2] Mr. Weldon, husband of the plaintiff, in 1878, called on Dr. Forbes Winslow to consult him regarding the mental condition of his wife. From statements made by him, Dr. Winslow was of opinion that an inquiry ought to be made, and if Mrs. Weldon were found insane, that she might be confined in his private asylum. Mr. Weldon was himself unable to sign the order of committal owing to the fact that he had not seen his wife within the legal period—in fact, had not seen her for three years. Sir H. de Bathe did so, however, having called on Mrs. Weldon within the required period. Dr. Winslow thereupon asked Drs. Semple and Rudderforth, friends of his, to visit the plaintiff (which they did on 14th April of that year at her residence, the property of her husband), and to examine the lady respecting her mental condition. Accordingly, together, these gentlemen paid the visit—first, making a joint examination, and then a separate examination, the one leaving the room while the other examined alone. The interval of absence during the separate examination, they averred, was at least a quarter of an hour, while the plaintiff swore that it was not more than five minutes. The result of this examination was that they signed certificates of lunacy. On the strength of these and of the order for committal, Dr. Winslow's secretary, with nurses, came to her house to remove her to the asylum, but was frustrated by friends of the plaintiff. Mrs. Weldon then took to a place of hiding for a month, during which time only the order of committal remained in force. In 1885, she raised an action against Dr. Semple for false certification of insanity and for trespass, and asked damages to the extent of £1000. The case was tried in July of that year before Mr. Justice Hawkins and a jury, and the trial lasted several days. Mrs. Weldon conducted her own case, and did so with considerable ability. The defendant in the witness-box swore that what he did was done honestly, without malice or malicious motives of any kind, and that in signing the certificate he believed her to be insane. The jury, however, returned a verdict for the plaintiff, and awarded for false certification damages of £1000, and for trespass further damages of £20.

The other case was an action for libel and conspiracy against Drs. Whittle and Hutchinson, practitioners in Liverpool, and Mr. Mould, of the Royal Lunatic Hospital, Cheadle, Manchester; against the former for having signed certificates of lunacy of the plaintiff, and against the latter for having received her into the asylum on the strength of these certificates. The action was tried before Mr. Justice Cave and a special jury, and occupied five days in hearing. The following is a brief history of the plaintiff. After the death of her first husband, her

[1] *B. M. J.*, vol. ii. 1884, p. 392.
[2] Paper by Author, *Glasg. Med. Jour.*, Sept. 1886.

children were in 1874, by reason of her drinking habits, removed from her care by an order of the Court of Chancery, she being held unfit to take charge of them (as trustee under her first husband's will). In 1877, she was confined in an asylum, and was there for three years. During this period, it being considered improbable that she would recover, a petition was presented to the Lord Chancellor for an inquisition, which being held, resulted in her being found insane, and a committee was appointed on her estate. In 1880, she was liberated from the asylum on probation. After her liberation, one of the defendants with another practitioner certified that she was then sane, and the finding of the inquisition was set aside. Soon after this, however, symptoms of insanity of a glaring character presented themselves, and she was certified by the defendants in the above action as being insane, and was received into Cheadle Asylum on the strength of these certificates. These were rejected, however, by the Commissioners in Lunacy as being too weak, and she was discharged, but was again committed on fresh certificates granted by two Manchester practitioners. Mr. Justice Cave ruled that the defendant, Mr. Mould, must be excluded on the ground of privilege, and although he summed up strongly in favour of the other defendants, it took the jury two hours to find a verdict accordingly.

What does the law demand of the medical practitioner who signs a certificate of lunacy?

I. In England:—

A. (*a*) He must not be related to the petitioner (where petitioner is a man) as father, father-in-law, son, son-in-law, brother, or brother-in-law.

(*b*) He must not be a partner or assistant of the other signator;

(*c*) He must not be the person under whose charge the alleged lunatic is to be placed; nor can he be the usual medical attendant of an insane person in a "single-patient" house, if he has signed the medical certificate upon which the Reception Order or Urgency Order is based.

(*d*) He must not be a person who is interested in the payments on account of the patient, or in the profits of the institution in which the alleged lunatic is to be placed.

B. (*a*) The examination upon which the certificate is founded must be made within a period of *seven clear days before the presentation of the petition;* or within *two clear days, where an Urgency Order is used;*

(*b*) It must be made "separately from any other practitioner";

C. (*a*) The terms of the certificate must be definite and clearly expressed, and it must contain sufficient evidence of the insanity of the person named in it as will be convincing to any average intelligent individual;

(*b*) One of the certificates ought to be given by the usual medical attendant of the alleged insane person, or, if not, the reason why should be stated;

(*c*) That before granting the certificate in England the signator has read over section 317 of the Lunacy Act of 1890.

Presumably with the object of answering the "separate" examination above referred to, the blank schedules of certificates are printed on two separate forms. In Scotland, however, both are on the same schedule.

What is meant in law by an examination made "separately from any other practitioner"?

Obviously, the intention of the Legislature is that the state-

ments made by the certifiers, as they have the force of statements made upon oath, shall have all the cumulative force of concurrent testimony by each examiner separately noting facts in the person examined which are indicative of unsound mind. Mr. Justice Hawkins in Weldon *v.* Semple, although he was speaking before the current Act of 1890, which, however, in no wise differs in this respect from the previous Act, said on this point, that the object of the statute was that the medical men should be independent and that they should make separate examinations; and speaking of the facts of that case he added: "The statute requires separate examinations by the medical men, and [here] they both go together—as gross an evasion of the Act as could be conceived;" and, again in his summing up: "anything more calculated to excite suspicion could not be supposed than both the doctors meeting and going together;" in short, he made it clear that, in his view, the defendant had not made a separate examination as required by law. It may therefore be concluded that the absence of, or the semblance of the absence of a separate examination by the medical certifiers would not only vitiate their certificates, but would render them liable to an action of damages for false certification. It is, at the same time, a common practice, dictated by prudence and expediency alike, for the medical attendant to call to his aid in such cases, a specialist in mental diseases, and for both to meet at the house of the patient; and it is obvious, that in order that the consultant should properly apprehend the case, the previous history and present condition of the patient should be fully explained to him before he examines the patient. According to the above ruling, it might be held to be unstatutory that both of these should sign certificates under such circumstances. Therefore it would be a safer course to pursue were the consultant first separately to examine the patient, and the usual medical attendant to do so later on the same day or on the following day. Such a procedure would not only conform to the spirit and letter of the law, but it would, at the same time, give both the patient and the family attendant more unequivocally the benefit of the special knowledge of the consultant. If medical men proceeded to the duty of lunacy certification with a clear conception of the importance of the act they were about to perform, their *bonâ fides* would seldom be questioned, as the absence of it would seldom be apparent.

But the certificate must be definite and sufficient as to its terms. The certificate is a legal document, and in it must be embodied the identity of the signator and also, it may be, of other persons; therefore careful attention must be paid in this regard, because technical error arising from want of identity will invalidate a certificate. For example, if the signator omitted to give the necessary identity of the persons who have provided him with the "other facts observed by others" such a certificate would be null and void, since upon the facts so given him he has partly established his opinion of the insanity of the person named in the certificate.

Probably there is no more common fault in such certificates than the imperfect or improperly-expressed data upon which the insanity of the person is determined, or from which it may be deduced. The certifier ought always to bear in mind that it is not enough that he

himself is convinced of the insanity of the person, but that he should put down such facts as he has observed of the insanity or unsoundness of mind of the person named in the certificate in such a way as will carry conviction to the mind of the average intelligent person. It is not sufficient to say that the person is labouring under delusions which the certifier may himself know actually are delusions, but he must state that he has inquired into the truth or reality of the patient's statements and has proved them to be unfounded; for example, it would not be enough to state of a person in humble circumstances as evidence of delusion, that he or she says, "I have had a telephone message, or a letter from the king;" for although he may himself know that this is a delusion, he must state that he has made inquiry on the point and that the statement is quite groundless, which will establish the statement to be a delusion. If a patient said, however, that he had received a letter from God Almighty, the statement by itself would prove its delusional character. Moreover, it is by no means uncommon for certain patients, usually women, to make such assertions as that their husbands are unfaithful to them, or that their children have been turned against them by their father. Such a statement in a certificate would, in itself, be no proof of insanity, for it might reasonably be true; therefore, it must be stated that inquiry reveals the very opposite, or that it is not true in fact. As a general premiss, it may be laid down that no statements which fall within the region of realisation ought to be stated as evidence of insanity unless and until they have been proved not to be existent in fact, and this proof be stated in the certificate. Further, no language should be used in the certificate which is capable of conveying to different minds other reasonable meanings than that intended by the user. It is not proper to use such words as "incoherent," "irrational," "morose," "wild," or such phrases as "curious in manner," or, "behaves absurdly," since there are no standards by which the average mind can grasp the precise meaning intended to be conveyed, and the words themselves convey no precise meaning of the facts intended to be conveyed. The certifier should, therefore, state facts which of themselves exemplify the condition, and should cite instances of incoherency, irrationality, moroseness, wildness, or absurdity of behaviour, or singularity of manner in the mind or conduct of the patient. This enables any other person to infer from the stated facts the qualities of mind devious from normal which the patient exhibits. It is a good rule, in addition, to use in the certificate the names of persons instead of pronouns. For unmitigated blundering in composition, the following, which is given by Mercier,[1] would be difficult to beat: "Mrs. B.—sister to the patient—states that she has an idea that she can make their fortunes by electricity, has attempted suicide, religious mania, dirty habits, craving for drink, smashes all she can get." Plain, short sentences are always better than long complicated ones, as the facts emerge more quickly and more easily; and a narration of the facts makes more apparent upon the face of the certificate that the examination has been made with care and that pains have been taken.

Protection of Practitioner.—For some time prior to 1890, many medical men refused to sign certificates of lunacy, because of the

[1] "Lunacy Law," p. 29.

actions which had been laid against members of the profession and which were productive of great vexation in many instances; they, therefore, declined the risks. This was fortunately recognised by the Legislature in the passing of the Act of 1890, and in section 330, sub-section (1), it was enacted that—

"A person who before the passing of this Act has signed or carried out or done any act with a view to sign or carry out an Order purporting to be a Reception Order, or a certificate that a person is of unsound mind, and a person who, after the passing of this Act, presents a petition for any such order, or signs or carries out or does any act with a view to sign or carry out an order purporting to be a reception order, or any report or certificate purporting to be a report or certificate under this Act, or does anything in pursuance of this Act, shall not be liable to any civil or criminal proceedings, whether on the ground of want of jurisdiction or on any other ground, *if such person has acted in good faith and with reasonable care.*"

Further, to protect a medical signator against vexatious litigation, the next sub-section was added to the foregoing, viz.:—

"If any proceedings are taken against any person for signing or carrying out, or doing any act with a view to sign or carry out such an order, report, or certificate, or presenting any petition as in the preceding sub-section mentioned, or doing anything in pursuance of this Act, such proceedings may, upon summary application to the High Court, or a judge thereof, be stayed upon such terms as to costs and otherwise as the Court or judge may think fit, if the Court or judge is satisfied that there is no reasonable ground for alleging want of good faith or reasonable care."

While, however, such enactments as the foregoing will not prevent the raising of actions, the medical signator who has conformed in his duty to the requirements of the law may calmly view the proceedings, knowing that the law will interpose between him and a vexatious litigant.

In the first case tried after the passing of the Act—Toogood *v.* Wilks (Queen's Bench Division, 1889)—Mr. Justice Field ruled that the burden of proof that there was no reasonable ground for alleging want of good faith or reasonable care in certification fell upon the defender. In this case, by reason of good faith having been proved, the Judge stayed the action. The law, therefore, on this point would appear to be that the medical defendant in such an action must prove to the Court that he has performed his duty in good faith and with reasonable care. So also in Mason *v.* Marshall, Shaw, and Gauchard (Bristol Spring Assizes, 1888), which was tried before the relief section of the Act of 1890 was passed, the Judge dealt with this question by asking the jury to answer the following queries, viz.: Did the defendants sign the certificates negligently and without care? Was the plaintiff's conduct, behaviour, and appearance such as to induce the defendants to believe the plaintiff to be of unsound mind and a person to be detained under treatment, and were the acts of the defendants honestly performed in that belief? Was the plaintiff at the times in question [when the certificates were signed] of unsound mind, and a proper person to be taken care of and detained under treatment? The jury answered all the queries for the defendants, and thus the action fell.

But there are practitioners who shrink at all hazards from actions at law, and who, therefore, will avoid such duties as may subject them even to the publicity which the raising of an action invokes. For such there are but two remedies, viz.: (1) to decline the duty of lunacy certification under all circumstances; or (2) to ask and receive from the relatives or guardians of the person regarding whom they are to

certify, a writing of indemnity against costs consequent upon any action which might be raised out of the manner in which they have performed the duty. This might be a reasonable demand in some cases; but, after all, when the total number of certifications is contrasted with the small number of legal actions, the risk of certification is indeed but very small.

TESTAMENTARY CAPACITY.

In a previous chapter we discussed the conditions necessary to be present in a person who disposes of his estate by a will which, on emergency, is to be written by a medical man, the attendant of the testator (*vide* p. 76). It is only necessary to repeat that, whenever possible, such an office should be declined by a medical man when the services of a legal practitioner are procurable, and that it should only be undertaken under the most exceptional circumstances. The duty of giving evidence of the testamentary capacity of any given testator usually falls upon medical witnesses, although it is not confined to them. It has been said that in the case where a medical man has signed as a witness to a will he *ipso facto* certifies of the testamentary capacity of the testator. We can hardly think that this is the law, since all that the signature involves is testification of the reality of the signature of the testator. In all legal documents where any one acts as a witness, he does no more than testify to that fact, for he may not be—and the fact does not affect the validity of his signature—acquainted in the least degree with the contents of the document which has been signed. There is perhaps a sense in which the adhibition of the signature of a medical man as witness may be taken as confirming the capacity of the testator, but not in the legal sense.

In cases of disputed wills in which the ground of action is the incompetency of the testators to make such wills, doubtless the evidence of the medical attendants of the testators will prove of the greatest value. It is therefore advisable for medical men, in order to maintain an attitude free from the semblance of bias or partiality, to avoid being witnesses to signatures of testators.

In order that a will be valid—from the medico-legal point of view—the testator must be in possession of a "sound and disposing mind." But this sound and disposing mind may be quite consistent with certain departures from sanity, and it may be inconsistent with an absence of insanity as such in the ordinary sense, where for example, by reason of degenerative changes in the brain of an old person, the mind has become weakened and facile. While medical men are not specially interested in the definitions of this sound and disposing mind as given by different judges, they must take them into consideration in forming a judgment in any given case as to whether or not a given testator shows evidence of this state of mind. If, then, such legal definitions be reviewed, it will be found that the following are the points to be considered as characteristic and definitive of the absence of a sound disposing mind, viz.:—

(*a*) Idiocy or imbecility, congenital or acquired early in life;

(*b*) Impairment of mind by old age;

(*c*) Impairment or enfeeblement of mind by illness;

(*d*) The presence of insanity.

This was the definition of Lord Penzance in the case of Smith *v.* Tebbett.[1] While it might *a priori* be assumed that in such states the disposing mind would be affected, yet the law admits that there may be sufficient intelligence remaining, although reduced from an average standard, for the legal exercise of the disposition of an estate. This is well exemplified in many legal decisions of cases in which the testators were the acknowledged subjects of delusions, sometimes of the most glaring character. It is therefore apparent that the law allows of considerable latitude in the interpretation of the mental state with reference to testamentary capacity. The test in any case resolves itself into this: Was the testator when he made the will in possession of sufficient intelligence so to do? According to Mr. Justice Erskine, in the case of Harwood *v.* Baker tried before the Judicial Committee of the Privy Council, the testator must exhibit the following qualifications, viz.:—

(*a*) A knowledge that he is giving his property to a person or persons named;

(*b*) That he knows and comprehends the extent of his possessions;

(*c*) That he comprehends the nature and effect of his act in its bearings on the claims of others, which have had his consideration.

Thus it works out that the problem which the medical witness has to satisfy and solve, is, Whether a given testator is in such a mental condition, by reason of natural incapacity, old age, illness, or insanity, rendered incapable of comprehending that he is willing away his property to a certain person or persons, of knowing the extent of his estate, and of understanding the nature and effect of his act with relation to the natural claims of those excluded from the will. The only means at the command of the medical witness to answer this problem are the acts and sayings of the testator, not only in connection with the single act of testamentary disposition, but with reference to the acts of his daily life and his communications with those around him. And however we may view the presence or absence of any cause which might tend to mental enfeeblement or impairment, its extent and its effect can only be judged in the end by the sayings and doings of the testator. But viewed in a narrower aspect, it will have to be considered, even in the presence of evidence of mental impairment in one direction, whether that so impairs the mind that the impairment is projected into, and prejudices the ability to rightly perform, the act of disposal of his estate. It is quite admitted, as has been said, by Courts of Law that the existence of mental unsoundness in certain directions is no bar to a sound testamentary disposition.

APHASIA AND TESTAMENTARY CAPACITY.

Of late years much attention has been given to the relation of aphasia to testamentary capacity, and to the duty of a medical attendant of an aphasic person in assisting at his will-making. The

[1] L. R., 2 P. & D., p. 400.

clinical manifestations of aphasia are so varied, and the mental condition of such patients so apparently helpless to the average layman, that it will be strange if such wills are not some day contested. But while in certain cases of aphasia the memory, reasoning, judgment, and volition are apparently but little, if, indeed, in any degree, prejudiced, in others there can be little doubt they are considerably affected. As a general rule, it has been found that in total aphasia (*i.e.* combined sensory and motor aphasia) the mental defects are greatest, in motor aphasia, least, and that in sensory aphasia (simple loss of memory for words, word deafness and word blindness), the impairment occupies a middle position between the two former. As a general statement of the case, it may be said that the more extensive the aphasic defect the greater the mental enfeeblement, and the less the testamentary capacity of the person. But, as in mental unsoundness generally, the only relevant statement is that which has direct and particular reference to any given case. Since in certain cases the person is incapable of understanding spoken language, in other cases, written language, in certain others, both spoken and written language, and in other cases still, is unable to put down in writing his wishes, it will be obvious that *primâ facie* disabilities attach to such a person in making a will, since in the case of the person who cannot write at all, or can but imperfectly write his wishes, the only medium of communication is by signs, which, because possibly of the mutual inacquaintance of sign-interpreter and patient of the meaning intended to be conveyed, are at best but a very imperfect medium. Thus it happens that the medical attendant of the patient, because of his acquaintance with the cause of the origin, progress, and nature of the aphasic condition, is an invaluable person at the process of will-making. It is not necessary to repeat what has already been said as to the indications in a testator of a sound disposing mind, but it is necessary to draw attention to the special difficulties which surround the will-making of the aphasic individual. The law, as has been pointed out, puts a broad, liberal interpretation upon the amount of mental power necessary for the making of a will. Lord President Robertson, in a case of contested will which was tried before him and a jury in July 1898, said: "He must remind them [the jury] that they had not got to try the question whether in the general sense the woman [the testatrix] was sane or insane. The question was much more narrow and limited. It had reference to this particular will—had she enough mind to understand it, and did she understand it? because there were many people in this world who had got what might be called a crack in them, and were really eccentric, and yet their wills were perfectly good. They might think that it was too complicated for the woman; and if so, then they would find against the will. On the other hand, they might think, although they had heard a good deal of trash about the woman's eccentricities, that still she had enough sense to make a will, if it was a will that she could understand. . . . They must not break the will unless they really thought that either she was unfit to make it, that she had not sufficiency of mind to make it, or that she was weak and was led into making it by other people." The foregoing may be taken as an exposition, in plain language, of the law regarding testamentary

capacity, of aphasics as of other persons. The law, however, has had an opportunity on more than one occasion of inquiring into the will-making power of aphasic persons. The first was that of a clergyman, the Rev. J. T. L., a man of 63 and a widower, who on the eve of contracting a second marriage became aphasic, in which condition he could neither speak nor write, yet was able to convey to his medical attendants a clear and definite impression of his intentions and desires in disposing the usufruct of £30,000 to the lady to whom he was to be married, the capital of which sum at whose death was to revert to his own family, and then to be divided fairly and equally. Probate of the will, however, was not granted, because the testator had placed his mark in the middle of the document instead of at the foot, in terms of the statute 4 Vict. cap. 26, sec. 9—the Wills Act—or of the 15 Vict. cap. 24, sec. 1—Lord St. Leonard's Act—but it was apparent that, but for this technical flaw in the will, probate would have been granted.[1] The second case which was reported in the *Times*, Feb. 13, 1900, and of which an account of the aphasic condition is given fully by Dr. Edmunds,[2] shows how the difficulties of will-making of an aphasic patient were surmounted in the most ingenious manner. The testatrix, a lady of some force of character, accustomed to manage her own business affairs, and possessed of a large estate, became aphasic. Dr. Edmunds expresses her condition thus: "In-going ideas by way of ear or eye seemed to find complete mental receptivity. Out-going ideas were completely barred for want of power to utter them either in speech or in writing." It was important that she should make a will, and she was desirous of doing so. Dr. Edmunds devised a plan, which, assisted by her solicitor who was familiar with the extent and nature of her estate, was carried through with great success. As she could mentally grasp by reading short groups of words, he hit upon the device of having printed a system of bold printed cards upon which various items of her estate were named in print, duties which would follow upon her death, as appointment of executors, and a series of cards bearing the names of those persons likely to become beneficiaries under the will, and of those likely to be named as executors. By means of these cards, which she sorted out and grouped, her desires were so clearly expressed that her solicitor was enabled to draft her will, which on a second occasion was read over to her clause by clause, with the result that it received her full assent, and with some assistance she put her mark to the will, which was formally witnessed by Dr. Edmunds and her solicitor. At her death, and as her will disposed of landed property and personalty to a large amount, the will had to be proved, which was done in open Court before Sir Francis Jeune, who pronounced in favour of the will and of the method adopted to arrive at the wishes of the testatrix. Sir Francis Jeune remarked in his judgment that "this case is not quite an easy one because, so far as I know, it represents to me, at any rate, a novel mode of arriving at the real wishes of the testatrix, and I am perfectly conscious that what is suggested to me is suggested with a great deal of force, namely, that this method, although most well intended, and in its way most

[1] "Law Reports," Probate Division, vol. xii. 1887, p. 8.
[2] *B. M. J.*, vol. i. p. 749, *et seq.*

ingenious, and on the whole, I think, satisfactory, leaves it open to question whether or no it does exhaust the wishes of the testatrix, because, as has been pointed out, there is the necessary limitation, namely, that the wishes of the testatrix were bound by what was to be found on the face of these cards, and it is conceivable that there may have been a legacy, perhaps to a charity, or it might be a legacy to some person not within the circle of her relations, but a friend who may have been passing through the mind of the testatrix that she desired to make but to which she was quite incapable of giving effect. Or supposing this sort of case had been set up in its extreme form, that some name of a relation was by accident omitted, and was not on a card, or in a more extreme form, if it had been shown that she had expressed at other times the fact that she had in her mind the intention of benefiting some person or object not named on these cards, I think it might be shown that these cards did not, in fact, contain the whole statement of her wishes. But taking the matter as it stands, I think I am satisfied that her wishes were fairly ascertained. Everything was done that could be done. Nothing could have been more fair and ingenious (I mean skilful; I do not mean to suggest any kind of subtle ingenuity), more skilful than the means adopted by Mr. Garrett [the solicitor] and Dr. Edmunds; and I think they did everything any human being could do; and inasmuch as they did put all the names of her relations, and as there is no reason to suppose she desired to benefit anybody but the relatives, I think on the whole one may say the will expresses her desires." Sir Francis Jeune commented upon the fact that the testatrix had evidently desired to appoint another executor but failed to do so because she could not find his name among the cards, but he said that, by the will being read over to her, clause by clause, she had had a second opportunity of checking the accuracy of the will, had she had any desire to do so, and he adds: "I think she had quite sufficient strength of mind and knowledge of the will to lead her to disapprove of it if she wished to. On the whole I think the method was fairly and satisfactorily adopted, and I feel satisfied that the will is the real will of the testatrix." For fuller details of this most interesting case, we must refer the reader to the references given; but it must be added that the plan adopted, if not quite perfect, was as nearly perfect as could be, for it saved the putting of questions verbally which, it could be argued in a contested case, might be a source of confusion to the testator. In cases where this verbal mode of communication is adopted, however, it is advisable to intentionally make occasional glaring misinterpretation of an impression or instruction, so that the mental action of the patient may be tested. The testamentary capacity of any aphasic person can only be measured, in short, by the character and extent of the brain lesion and its effects upon the operation of the mind with respect to receptivity.

CRIMINAL RESPONSIBILITY.

This has been, and is still, a very vexed question, in respect of the divergences in the legal and medical definitions of insanity. Doubtless, the difficulties in arriving at a common solution have not been lessened

by the aggressive character of medical opinion on the subject, and also by the variability of procedure practised by different judges. There are some who see in the perpetration of every barbarous and abominable crime only the operations of insane persons, and with whom the perpetration of crime is synonymous with insanity; there are others who believe that the class of criminals whose actions are actually dominated by insanity is comparatively but small. They do not hesitate to say that the popular tendency to initiate reprieves of capital sentences on the ground of insanity of most notorious criminals is productive only of harm. There exists a third class, perhaps the largest, which believes that the truth lies at some intermediate point between these extreme positions, and that each case must be investigated fully and decided on its merits. This last view is the most reasonable, and is a common ground of operation for both professions of law and medicine.

The plea of insanity may be raised at two stages in a criminal charge: first, in bar of trial, and, second, in bar of sentence. The former is pleaded because the accused is incapacitated by mental defect, or unsoundness, from instructing his defence. When so raised, the Court will allow a proof without empanelling a jury, and, if the fact of insanity be proved, the Court will find that the accused cannot be tried for the crime of which he is charged, but will order him to be confined during the Royal pleasure.

A remarkable case was brought before Mr. Justice Darling at the Central Criminal Court, London, in November 1897.[1] The facts were these: A man named Harris was charged with the crime of murder. After killing his victim, he attempted to commit suicide by cutting his throat. The effect of his self-inflicted violence was to destroy his vocal cords, so that he was unable to speak. Neither could he read or write. Hence he was unable to instruct his defence. It is the law that punishment cannot follow a criminal act (1) where the accused is found to be insane, (2) or is mute, from defective organisation, (3) or where the accused cannot plead from want of an adequate interpreter or an interpreter of any kind. This man Harris being unable to speak, to read, or to write, was, to all intents and purposes, mute, and thereby unable to instruct his defence. Mr. Justice Darling, however, put certain questions to the jury, in answer to which they found that the prisoner could plead to the indictment, that he was sane, that he was not then capable of instructing his defence, and that the cause of his disability was the result of his own unlawful act. On this finding, the Judge ordered the trial of the case to be adjourned till the next sessions.

In the latter contingency—the plea of insanity in bar of sentence—a special plea of insanity may be put forward, and if the insanity be proved, the jury will be directed to acquit the prisoner on that ground, but the Court shall order the accused to be confined in an asylum during the Royal pleasure.[2] By what tests ought criminal responsibility to be gauged? If we approach the subject of criminal responsibility first of all from the legal side, we shall, perhaps, be better able to comprehend and appreciate the differences, if any, which exist from the medical side. The legal aspect of the subject may be taken with the greatest confidence from Sir James Fitzjames Stephen,[3] who, in his treatment of the subject, starts from the proposition that legal authorities have been right in "holding that the mere existence of madness ought not to be an excuse for

[1] *B. M. J.*, vol. ii. p. 1671. [2] 20 & 21 Vict. c. 71.
[3] "History of the Criminal Law of England," vol. ii. pp. 124–186.

crime, unless it produces in fact one or other of certain consequences . . . that the principle which they have laid down will be found, when properly understood and applied, to cover every case which ought to be covered by it. But the terms in which it is expressed are too narrow when taken in their most obvious and literal sense, and when the circumstances under which the principle was laid down are forgotten." He further makes the statement that the subject "is one of the greatest difficulty, and it is most imperfectly understood by medical men as well as by lawyers." Because, in the case of the former, of the want of appreciation of the different degrees of authority to be ascribed to different judicial declarations of the law, the want of acquaintance with the rules for the interpretation of these, as well as for other reasons. He sounds an excellent note in the statement that in a subject so obscure and so difficult the two professions should rather try to assist each other in its solution than to speak harshly of each other. What, he asks, is the meaning of the word mind? He answers that it is a general name for the combined operations of sensation, intellect, emotion, and volition. Regarding this answer there should be no difference of opinion. Any aberration of the mind, therefore, must be indicated in one or other, or more than one of these functions. The difference between a sane and an insane mind will consist in the normal or abnormal existence of these mental functions. He argues rightly, that when a man either "feels, knows, believes, remembers, is conscious of motives, deliberates, wills, or carries out his determination," it is through the agency of the brain and nervous system that they can be accomplished, but the physiological bases of operation no man can formulate or define, although he may speculate regarding them; that the brain being an organ of great delicacy is liable to a great many varied diseases—using this word in a broad sense—some of which interfere with the due performance of the mental functions, while others do not. If these diseases be reviewed with regard to the incidence of their effects, it will be found that they may be divided into two different groups, viz.: (1) those which affect prejudicially the emotions, either with respect to their morbid production, their control, or their persistence; and (2) those which affect prejudicially the operation of the intellect and will. Of the former class which affect the emotions, the effect of their operation is either melancholia, where the emotions are depressed, or mania, where the emotions are preternaturally excited. But there is a form of interference with the regulated and normal action of the will which is characterised by incontrollable impulse, and which may appear in persons, who, otherwise, look in normal mental health, but in whom, on careful inquiry, certain factors —it may be of heredity, for example,—are found which may be reckoned as accountable for its genesis. It is, therefore, apparent that insanity may taint every mental function, and may exhibit itself as unnatural actions, delusions, hallucinations, exaggerated impulses, and moral insensibility.

The law recognises that insanity may be an excuse for crime committed by a person in that condition. In Sir James Stephens' Digest,[1] he puts this proposition as follows: "No act is a crime if the

[1] *Op. cit.*, Art. 27.

person who does it is at the time when it is done prevented [either by defective mental power or] by any disease affecting his mind,

"(*a*) From knowing the nature and quality of his act, or

"(*b*) From knowing that the act is wrong [or

"(*c*) From controlling his own conduct, unless the absence of the power of control has been produced by his own default].

"But an act may be a crime although the mind of the person who does it is affected by disease, if such disease does not in fact produce upon his mind one or other of the effects above mentioned in reference to that act." It is to be noted that the parts bracketed are deemed by Sir James Stephens as doubtful law.

The exposition of the law, upon which decisions are now made, was given in the answers of fourteen judges to certain questions put to them on abstract issues by the House of Lords in June 1843.[1] The cause of this step was the acquittal, on the ground of insanity, of M'Naghten in 1843, for the murder of Mr. Drummond whom he shot by mistake for Sir Robert Peel, for whom he had lain in wait. In that case, the medical evidence was to the effect that "a person of otherwise sound mind might be affected with morbid delusions; that the prisoner was in that condition; that a person labouring under a morbid delusion might have a moral perception of right and wrong; but that in the case of the prisoner [M'Naghten], it was a delusion which carried him away beyond the power of his own control, and left him no such perception, and that he was not capable of exercising any control over acts which had a connection with his delusion." The answers which the jury gave to the questions put to them were to the effect that at the time the act was committed the prisoner did not have the use of his understanding so as to know that he was doing a wrong and wicked act, and that the prisoner was not sensible at the time he committed the act that he violated both the laws of God and man. It is impossible in our space to give all the questions and answers submitted and replied to, but the second and third questions and the kernel of the answers thereto must be given.

Question II. was as follows: "What are the proper questions to be submitted to the jury when a person, afflicted with insane delusions respecting one or more particular subjects or persons, is charged with the commission of a crime (murder, for instance), and insanity is set up as a defence?" and Question III.: "In what terms ought the question to be left to the jury as to the prisoner's state of mind at the time when the act was committed?" The pith of the judges' answer was: "That, to establish a defence on the ground of insanity, it must be clearly proved that at the time of committing the act the accused was labouring under such a defect of reason from disease of the mind as not to know the nature and quality of the act he was doing, or if he did know it, that he did not know he was doing wrong."

Sir James Stephens' comment upon these answers is that the questions were put in a very general form, and that they could hardly have been meant to be exhaustive, because if they were so meant, the implication is that the effect of insanity (if any) upon the emotions and will is left out of consideration, and is not to be taken into account in

[1] 10 C. & F., p. 200.

deciding whether an act done by an insane person did or did not amount to an offence, which, if it were put in the form of a proposition, would be contrary to experience. The interpretation of the law as laid down in the answer quoted, is however different in the rulings of different judges. Some adhere to its literal terms, and, logically, the medical evidence must be confined to a description of the state of mind of the accused at the time the act was done, which, in many cases, may be absolutely impossible, although an opinion might be hazarded on the point from his mental condition at the time of the examination. Other judges leave the jury to say from the evidence led whether the accused was "prevented by any disease affecting his mind from controlling his own conduct." This certainly enlarges the purview, and it permits of medical evidence being led of the mental condition of the accused at the time of examination, and, based upon that, as to whether any disease then present was likely to have been present at the time of commission of the act, and to have prevented him from controlling his conduct. Again, other judges put the question to the jury, whether the accused knew the nature and quality of the act, and whether he was of sound mind. This is a still more liberal interpretation of the law, inasmuch as, by implication, a person may be insane who at the time he committed the act knew the nature and quality of the act, and, consequently, any relevant medical evidence would be admitted which bore on the mental condition of the accused. It will be obvious from the interpretation which each judge puts on the law that the range and character of the medical evidence which is permissible will be affected. Some judges will permit of the fullest medical evidence, not only respecting the mental state of the accused at the time of examination, but also bearing on the state of the accused at the time the act was done; others will only permit the medical witness to testify to the details of the interview or interviews between the witness and the accused, and not of his opinion as to the sanity or insanity of the accused, since, it is argued, that is the question which the jury is to decide; others, again, desire not a mere record of the facts of the interview, but the opinion which the medical witness has reached therefrom. It is difficult, therefore, for a witness to know in any particular case before a particular judge what kind of evidence he is expected to offer; and there can be little doubt that a better feeling would prevail between the two professions if some more uniform practice were to be established, for it ought to be acknowledged that in matters medical the members of that profession might be expected to offer opinions from certain facts at which an ordinary judge, and certainly a jury, might be unable to arrive. The medical profession takes the law deferentially from the Bench, and surely the Bench should give deference, subject to the legal rules of evidence, to the opinions of the medical profession. It cannot be otherwise than difficult for a medical witness to understand why, in the same case, perhaps, in which he has been called upon to give opinions regarding the cause of death of a victim from violence, he or another medical witness is debarred from offering an opinion as to the mental condition of the accused person; for, after all, if it be the duty of the jury alone to form an opinion as to the sanity of the accused, should it not equally be the duty of the

jury to arrive at the mode by which the violence was inflicted which caused the death?

Assuming, however, that the witness is permitted to offer such relevant evidence as will throw light upon the mental condition of the accused at the time of the examination, and, by implication, of his mental state at the time of the commission of the act, what kind of evidence would justify the witness in offering an opinion of the insanity and irresponsibility of an accused person? The existence of delusions, generally speaking, and of delusions bearing specially upon the particular crime which has been committed would be strong evidence, because their existence betokens dissociated cerebral action. A delusion may act in one of two ways: (1) either by rendering the whole mental action abnormal and oblique, or (2) by rendering certain mental actions abnormal. For example, in the case of Hadfield who attempted the life of George III. by shooting, it was stated by Erskine, his counsel, that Hadfield imagined that he had constant intercourse with the Almighty, that he was bound to sacrifice himself, as the Saviour did, for the salvation of the world, and that he supposed, by committing this crime, that the law would put him to death, and thus the sacrifice would be accomplished. Thus he apparently knew the nature of the act he tried to do, and he knew it was wrong and punishable, because he expected to be put to death for it. In this case, therefore, this delusion so dominated his mind, that it could not be affirmed that his actions were not all more or less coloured by it, or that he was responsible for the result of his actions. On the other hand, a man may be the subject of a delusion which, under ordinary circumstances, would probably affect in some ways his actions, but with which, probably, no causal connection—from his standpoint—could easily be traced with a crime which he has committed. But who shall say authoritatively and without risk of error that either, or both, of such persons is responsible or irresponsible, is sane or insane? No one, with certainty; because the operations of the intellect may be distorted at the time the crime was committed so that, in the ordinary process of reasoning, assuming the delusion to have existed, such logical connection as might be predicated in a normal mind cannot be traced in these. If delusions are found to exist in a person who has committed a criminal act, it would be the duty of the examiner to discover, if possible, how far the processes of ideation and volition are affected thereby, and to demonstrate the path by which he has arrived at the conclusion that the person is sane or insane. What is a delusion? It may be defined as a perversion of judgment in which an erroneous belief has become fixed in the mind in spite of plain evidence that it is wrong, and which the person is unable to change. It is usually associated with the personality of the individual and consists of a view which he believes acts for his good or his hurt. It always implies, as has been said, the existence of some measure of disordered intellect. But while delusions are often fixed, they may, also, be more or less transitory and shifty in their character. Where such are fixed and are believed by the person to involve results prejudicial to him, acts of violence either toward himself or toward others are commonly found to accompany. A delusion differs from an hallucination in respect that the latter is expressive of a dis-

ordered sense; in other words, it is a perception by one or other of the senses without any external causation; thus a person labouring under an hallucination may declare he hears voices addressed to him where no such voice has been uttered. In addition to the existence of delusions, evidence of an unsound mind may be found in obsessions, which have been defined by Macpherson[1] as "a dissociated group of ideas which suddenly enter consciousness, disturbing the ordinary course of ideation, but not involving the personality of the individual . . . and is to ordinary thought what impulse is to normal action." In other words, it is dissociated thought. Impulse is essentially a defect of volition, and is characterised by the conscious performance by the individual of an action or series of actions in spite of his will power. Sir James Stephens frankly admits that there are cases in which insanity interferes with the exercise of the power of self-control, and, if such be proved, that the person should be held irresponsible; and he goes further, by stating that when the time comes for the criminal law to be codified, the question would require to be raised whether it should not be stated in express terms that insanity may destroy the power of self-control. Carrier,[2] in his monograph on the subject of obsessions and impulses to homicide and suicide, discusses the responsibility of persons afflicted in these ways. He affirms that the true tests of the existence of such mental states may be summed up in the word degeneracy, and that this degenerate condition is characterised by neurotic antecedents in the progenitors, and in the physical state and psychical condition of the individual. This stigma or blemish, exhibited in one or other, or more than one of these ways, is an essential and permanent indication of the tendency to degeneration, and lack of equilibrium in the degenerate person—in the intellect, the emotions, and in the will—is the characteristic of his condition, as shown by precocity, tenacity, intensity, and repetitiveness. Impulses are most frequently bound up with persistent possessory ideas or obsessions, of which they are the ending as the act is of the thought, and obsession and impulse are two phenomena of the same nature, constitute the most perfect expression of inharmonious mental action, and can only be met with in degenerates. Mental instability is the necessary condition to development of possessory ideas and impulses, and may be said to be that state of tension of the cerebral centre in which a parasitic perception is installed, which, becoming intensified, usurps and dominates antagonistic perceptions. It is this form of mental unsoundness, moreover, which the law has most difficulty in recognising, because unlike other forms in which there are tangible signs, there are in this form none to be found at the time of examination, which a medical witness can put before a Court convincing enough to enable the Court to differentiate between such a person and a reckless vicious criminal. The medical witness must rely upon his examination of the accused solely for his opinion as to sanity or insanity, and it will depend upon the range of the examination what evidence he may be able to offer. Carrier affirms that the examiner must take into account: (1) the

[1] "Mental Affections," p. 148.

[2] *Contributions a l'Étude des Obsessions et des Impulses a l'Homicide et au Suicide*, 1899.

mental history of the progenitors; (2) the physical condition of the person himself; and (3) the mental condition, with relation to the character of the crime which the accused has committed. Carrier emphasises the fact that the crime is purposeless or motiveless in character, that it is committed upon victims either the best beloved by the culprit, or upon those who are absolute strangers to him; that the crime itself does not exhibit the like atrocity of the act of an epileptic; that it is liable to be repeated; and that its perpetration is accompanied by complete unconsciousness on the part of the perpetrator. He builds his case of the existence of mental degeneracy upon the mental antecedents of the accused and upon the physical evidences of degeneracy which he bears upon his body—physical defects, in short—which, to be indicative of degeneracy, must present two necessary conditions, viz., that they are congenital, and that they are permanent; and, further, that such persons exhibit want of equilibrium, irregularity or asymmetry, of body, or of mind, or of both. In addition, the mental history of the accused, as well as his present condition, must be exhaustively inquired into, so that from the complete examination, the examiner may be able in giving evidence to place all the facts before the Court in such a way that they may be appreciated by intelligent laymen. According to the advanced psychological school, composed of such men as Lombroso, Ferri, and Garofalo in Italy, and Broca, Bordier, Lacassagne, and Manouvrier in France, a criminal is influenced by two orders of influence, viz., intrinsic influences, or those which have their origin in himself, and extrinsic influences, or those which influence him from without; from which flow two kinds of responsibility, viz., individual responsibility and social responsibility, neither of which, they declare, exists in the homicidal degenerate.

Another form in which unsoundness of mind may present itself is what has been called Moral Insanity, which has been defined by Pritchard[1] as "a morbid perversion of the feelings, affections, and active powers, without any illusion or erroneous conviction impressed upon the understanding; it sometimes coexists with an apparently unimpaired state of the intellectual faculties." So common a manifestation is it in cases of mental unsoundness that Esquirol[2] declared it to be the "proper characteristic of mental derangement." It presents itself in a variety of ways, and the results of its operations are often very remarkable. But between the dogged, wayward, and markedly eccentric person and the victim of a slight form of moral insanity who shall discriminate, and what is the dividing line, if any? Indeed when we review the legal attitude with respect to testators who present characters which apparently fall under one or other of these forms of mental unsoundness, and whose wills, though contested on the ground of insanity, have been proved, thereby indicating that in the eye of the law such persons were in possession of a sound disposing mind, and when we consider, in addition, that between certain forms of homicide committed by persons of unsound mind, and others which seem to betray only the outcome of fiendish brutality, there is sometimes little to enable a distinction to be drawn by the average intelli-

[1] "A Treatise on Insanity," 1835.
[2] *Dict. des Sciencés Med.*, vol. xvi.

gent layman; and moreover, when it is remembered that the law has been created for the protection of society against crime of every kind, we can the more readily understand why there exists an appearance of contesting allegations of mental unsoundness in bar of plea or in bar of sentence. While it is the duty of the medical profession, therefore, to stand between an irresponsible criminal and the punishment which would follow, if he were not proved insane and irresponsible, and, if necessary, to educate the judges of the law and the public upon the need for broadening the legal definitions of insanity and irresponsibility, such should only be done in temperate language, since the officers of the law are desirous solely of meting out law and justice, according to their interpretations of the law.

FORMS OF INSANITY.

As in other departments of medicine and surgery subdivision exists, so also insanity has been divided into different forms or types from the clinical symptoms. It must, however, be borne in mind that these are but arbitrary and academic divisions of one central condition, viz.: aberration of mind of different degrees and characters. It is enough for our purposes to state that of the many classifications which have been made, one of the best, perhaps, is that which was drawn up by experts—the International Congress of Alienists, in 1867—and which is as follows:—

Simple Insanity:—
- Mania.
- Melancholia.
- Recurrent Insanity.
- Moral ,,
- Delusional ,,
- Impulsive ,,

Epileptic Insanity.
General Paralysis.
Toxic Insanity.
Puerperal ,,
Idiocy and Imbecility.
Senile Dementia.
Sequential ,,
Dementia due to coarse Brain-lesion.

Dr. Fitch of Halifax[1] has suggested a scheme for the definition, classification, and discrimination of the various forms of insanity, which is based upon easily recognisable symptoms, for the purpose of differentiation of responsibility and irresponsibility. It is worthy of careful consideration, but we cannot do more than refer to it.

For the purposes of the law, however, a much simpler classification has been adopted, viz.:—

Dementia Naturalis = Idiocy and Imbecility = Congenital or Developmental Insanity.

Dementia Adventitia = Acquired Insanity.

The term "non compos mentis," while it may be made to cover both of the above divisions, is more commonly used to designate less-

[1] *Med.-Legal Journal of New York*, June 1898.

developed forms of mental unsoundness than are included in the above.

As this is simply a treatise of the medico-legal aspects of insanity, the reader is referred for the clinical sides of it to treatises of Insanity.

SOMNAMBULISM AND HYPNOTISM, IN RELATION TO CRIME AND RESPONSIBILITY.

A case of a very interesting character was tried at the Leeds Assizes, 1901, in which the question of responsibility arose under curious circumstances. A young man, of previous good character, was charged with an offence under the Criminal Law Amendment Act, in that he was found by a girl, who was residing in the same house, in her bed, clothed in trousers and shirt. The prisoner, when accused, declared that he must have gone there in his sleep, as he was the victim of somnambulism. His father testified that the accused, another son, and his wife, were the victims of the somnambulistic habit, and that he had on former occasions found the accused trying to climb out of the window during his sleep. The jury found the prisoner not guilty. Closely allied to the phenomena of somnambulism are those of hypnotism.

Hypnotism is the modern designation of certain psychical conditions, and was formerly known by the names of animal magnetism, electro-biology, Braidism, and Mesmerism, the last two from the surnames of men who practised and wrote concerning the art. Although the phenomenon has apparently been known since ancient times, it is only during the last twenty years or thereby that it has received considerable attention by scientific observers. Hypnotism is difficult to define. It may be said to be a sleep-like condition which is capable in apt subjects of being induced by artificial means or by suggestion, the condition being based upon physiological states of the brain and nervous system, not yet, however, well understood. The precise form which it will take in a person put under its influence cannot be predicated. In one individual it may take the form of a cataleptic state, while another may be able to execute complex movements at the will or suggestion of the operator. The principle of hypnotism seems to be this—the concentration of the mental energy of the subject on an object or an action, through a sense-organ or by ideation, the action of the other brain-centres or functions being meanwhile inhibited, the production of fatigue in the centre or function involved, and the induction of drowsiness, lethargy, or sleep which is called the hypnotic condition. During this state, the subject is under the influence of the suggestions of the operator. It would appear, therefore, as if on the part of the subject no degree of volition remains, except that which is originated and determined by the will of the operator.

The question, whether an operator who puts a subject into the hypnotic condition is capable of unduly influencing the mind and actions of the subject, came into prominence in this country in the case of Kingsbury and Crofton *v.* Howard, which was tried before Mr. Justice Barnes and a special jury in the Probate Division of the High

Court of Justice, in July, 1898. The plaintiffs—Dr. Kingsbury and Mr. Crofton—were executors appointed under the will of Mrs. Howard of Blackpool, who left an estate worth about £90,000. Of this total amount she left about £30,000 to charities, £30,000 to Dr. Kingsbury her medical attendant, and the remainder in legacies to relatives. The defendant—the only surviving son of the deceased—alleged that at the time the will was made the testatrix was of unsound mind, and that the first-named plaintiff had used undue influence over her by hypnotism. In the course of the trial, it was acknowledged by Dr. Kingsbury that he had hypnotised, or had tried to hypnotise Mrs. Howard, as a therapeutic agent in her treatment, but he denied that he had exercised any undue influence over her, or that her acts were consequent upon hypnotism or were of the nature of post-hypnotic suggestion. After a long trial, the jury returned a verdict for Dr. Kingsbury, with costs. The question still remains to be answered, whether under hypnotic suggestion a person might not be actuated to improperly sign documents, or will away an estate. Questioned in cross-examination on this point, Dr. Kingsbury in the above case stated that he did not believe in the possibility of persons being induced to execute deeds, wills, promissory notes, or to sign cheques in that way. In his book,[1] he expresses similar views. Other observers, however, do not express themselves so confidently, as, for example, Bentivegni,[2] and others. Obviously, the answer to this question will centre round the kind and amount of control which is attained by the operator over his subject by suggestion. It is quite clear that a certain degree of control is obtained by the operator, as shown by the acts of a subject which follow suggestions by the operator. But who shall say to what extent such control in individual cases may be attained, or what are the limits of suggestion? It would be impossible, in the present state of our knowledge, to affirm how far suggestions may operate upon the mind of a subject. Bernheim[3] in his experiments shows that even suggestions to perpetrate crimes may be conveyed to the minds of subjects, and that all the essential acts of the suggested crimes may actually be carried through by the subject, the only difference being that mock weapons or articles have been used instead of real ones. It is said by those who do not believe that the execution of improper deeds or documents or wills can be prompted by suggestion, and still less that crimes may be suggested to persons of rectitude or law-abiding persons in the hypnotic state, that such persons are protected from so acting by their moral consciousness. This, at best, is but a mere opinion, which must be qualified by the results of Bernheim and the views of such observers as Liégeois. Milne Bramwell[4] cites the authority of Liébeault and Liégeois for the statement that there are only 4 or 5 per cent. of hypnotised subjects to whom with absolute certainty commission of crime could be suggested. If this statement is capable of confirmation by further experience, a very serious aspect is given to the

[1] "The Practice of Hypnotic Suggestion," 1891.
[2] *Die Hypnose und ihre civilrechtliche Bedentung*, 1890.
[3] *Hypnotisme*, 1891.
[4] *B. M. J.*, vol. ii. 1898, p. 672.

subject, as the possibility of successful criminal suggestion is thus indicated.

It must, therefore, be considered to be an open question as yet whether undue influence may not be exercised over, or criminal suggestions may not be conveyed to hypnotised persons. If it be true that any person may by the exercise of his or her will successfully resist hypnotising influences or acts, then a certain safeguard exists against such possibilities as the above to occur in right-minded persons. There can be little doubt, however, that there are certain persons who are so constituted as to seem little able to resist such influences. Whether the health of persons repeatedly subjected to the hypnotic condition is affected prejudicially still remains undecided. One school of observers believes that prejudice is exercised, and another, composed of those, it must be said, who have practical and extensive experience in its employment, asserts equally strongly the opposite view. There the question must rest for the present.

But there is another important aspect of this subject. Since it is possible in the hypnotic condition to reduce a person into a state in which there is absolute loss of volitional power and incapability of resistance, and of utter loss of knowledge of what happens while the person is under its influence, further opportunities for the commission of sexual crimes upon females become possible. Gilles de la Tourette[1] points out that a female in the hypnotised state is at the mercy of an unscrupulous operator, and that, under its influence, rape has been committed. He quotes cases of this from Tardieu,[2] and from the writings of other observers.[3] In three of these cases, not only was rape committed, but pregnancy followed. We are not aware, however, of any recorded cases in this country of this crime being perpetrated under hypnotic influence.

Hypnotic influence has, moreover, been pleaded in defence of commission of crimes in the French Courts. This plea received considerable prominence in the trial of the Gouffé murder case (p. 147). The female accused—Bompard—pleaded as her defence that the part she played in the tragedy was the result or effect of post-hypnotic suggestion by the male accused, her paramour Eyraud. Although much evidence was given on both sides as to the validity of her plea, the jury did not accept the plea as proved and found her guilty.

In view, therefore, of the present state of knowledge of the range of action and of the effects, immediate and more remote, of hypnotism, the conclusions of the Committee of the British Medical Association, which was appointed in 1890, and which, after full investigation of the subject, reported in 1893, are not only justified, but ought, also, to constitute the attitude of the medical profession concerning this comparatively unknown condition. These conclusions are as follow :—

1. That hypnotism is frequently effective in relieving pain and procuring sleep ;
2. That dangers may arise from its use ;

[1] *L'Hypnotisme : Au Point de Vue Médico-Légale*, 1887.
[2] *Etude médico-légale sur les attentats aux mœurs*, 7th Edit. p. 90 ; *op. cit.* p. 92.
[3] *Annales d'hygiène et de médecine légale*, 1879, 3rd series, t. i. p. 39 ; ibid. t. vii. Jan. 1882.

3. That when used for therapeutic purposes, its employment should be confined to qualified medical men;
4. That female patients should not be hypnotised except in the presence of a relative or a person of their own sex; and,
5. That legal restrictions should be placed upon public exhibitions of hypnotism.

As yet no legal restrictions have been placed upon public exhibitions in this country, but they have been enacted in Prussia.

NOTIFICATION OF DEATHS OF POOR INSANE PERSONS IN ASYLUMS.

There is one other medico-legal fact which must be noticed. By virtue of a General Order of the Local Government Board of England which came into operation on Dec. 1, 1900, every death of every poor person of unsound mind in any workhouse, or asylum, must be notified to the Coroner of the district within 48 hours after the death, and, in addition, that the notification shall be accompanied by a statement signed by the Medical Officer, containing the following particulars: (*a*) name, sex, and age of lunatic; (*b*) whether married, single, or widowed; (*c*) the apparent cause of death; (*d*) the time of, and any unusual circumstances attending the death; also a description of any injuries known to exist at the time of death, or found subsequently on the body of the deceased; (*e*) the duration of the disease of which the lunatic died; (*f*) the names and descriptions of any persons present at the death; (*g*) whether or not mechanical restraint was applied to the deceased within seven days previously to death, with its character and duration, if so applied. For the purposes of this order, the expression "lunatic" means an idiot or person of unsound mind.

INEBRIETY.

The abuse of alcohol by persons may bring them under certain circumstances within the category of insanity and irresponsibility. This remark is not so much intended to illustrate the fact that alcoholism ~~may be~~ one of the more indirect causes of the insane condition, but to signify that insanity—~~it may be~~ of a temporary kind—may be induced by the direct effects of alcohol. The common law rule is that mere drunkenness cannot be pleaded as an excuse for crime, but, as has been seen, if a state of mental unsoundness has been produced by alcohol, it could be pleaded, and if proved, would be held to be an excuse. The question, therefore, resolves itself into whether or not an accused person who has committed a crime while under the influence of alcohol is or is not insane.

Lord Deas in 1881, in the trial of a prisoner who was charged with murdering a fellow-prisoner in a Glasgow police cell, remarked in his charge to the jury that "if a man was insane at the time he committed the offence, no matter whether the insanity lasted for ten minutes or for half-an-hour, merely under drink would not do, but if drink produced insanity for however short a time, and the man did certain things while insane that there was no reason to think he would

[illegible]

[illegible]

(Vide Gairdner's address at Birmingham

do while sane, that was quite enough." In former cases,[1] Lord Deas made it perfectly clear that, although drunkenness and *delirium tremens*, not amounting to insanity, were no excuse for crime, they were factors in the reduction of the quality of a charge of murder to one of culpable homicide. In 1892, Lord Kingsburgh[2] stated in his charge to the jury: "You are entitled to take into consideration in the question whether the full guilt of murder has been incurred in this case, the important fact that the man was intoxicated at the time, and to a certain extent using violence, quite unconscious as to the extent of it. Although he is responsible for that, he may not necessarily be guilty of murder." These decisions of the Scots Courts show that while the condition of drunkenness *per se* is not a complete answer to a charge, it may be a mitigating factor. In such cases as the foregoing, experience demonstrates that the alcohol taken either acts abnormally on an individual whose brain and nervous system are easily rendered unstable, or upon persons who have been the victims of profound brain and nerve disturbance, as from sunstroke, or other causes. It is a purely legal question how far such a man would be responsible for an act voluntarily committed which induced the condition of mind which led up to the crime, and, therefore, we need not discuss it further. The practice in English law-courts is to consider the existence of *delirium tremens* at the time a crime was committed as a full answer to the charge, on the ground that it constitutes a state of insanity and irresponsibility.[3] It may, therefore, be taken that, when the effects of alcohol amount to insanity and irresponsibility, they absolve the doer of a crime from sentence. It has been contended by some, however, that drunkenness of itself is synonymous with irresponsibility, but we are far from satisfied that this is anything like a true statement of the case; indeed, we go further and say that in the bulk of cases of drunkenness, responsibility for actions cannot be removed. We are free, however, to admit that there are certain cases in which drunkenness produces, or is evidenced by, maniacal frenzy, in which the individual is for the time being insane and irresponsible. Drunkenness, it must be remembered, is but a relative term; it does not lend itself easily to definition, and, therefore, the standards by which the existence of the state is gauged are very variable. To say even when a man is drunk is a most difficult problem. Further, the physiological effects of alcohol differ in different individuals. This is a matter of popular observation; consequently it is imperative when drunkenness is pleaded as an excuse for crime, that the whole facts must be laid bare before a court of law. That chronic alcoholism is not only a menace to the mental health of its victim, but is also productive of mental instability and defect, is proved by nothing so much as by the very enactments of the Legislature in the Inebriate Acts. In the Act of 1879 (42 & 43 Vict. cap. 19), it was affirmed that the habitual drunkard had power by his own act to secure his detention in a

[1] R. *v.* Dingwall, September 1867; 5 Irvine, 479; R. *v.* Granger, September 1878; *Scot. Law Reporter*, vol. xvi. p. 253.

[2] Kane, 3 White, 386.

[3] R. *v.* Burns (Liverpool Summer Assizes), 1865; R. *v.* Chaplin, Warwick Winter Assizes, 1878; R. *v.* Davies, Newcastle Assizes, Ap. 1881; R. *v.* Baines, Leicester Assizes, January 1886.

licensed institution for a period not exceeding one year, for the purposes of reformation and cure. The Act of 1888 (51 & 52 Vict. cap. 19), made the provisions of the former Act permanent. The Act of 1898 (61 & 62 Vict. cap. 60), while it contains no provision for the compulsory detention of non-criminal habitual drinkers, does contain provisions for the detention of criminal inebriates of both sexes, for reformative purposes. In the present state of the law, it would be impossible to enact the compulsory detention of non-criminal inebriates either in a prison or an asylum, so long as they do not commit any breach of the law, and so long as they are not certified to be of unsound mind. The provision, in the case of criminal inebriates convicted of an offence punishable with imprisonment or penal servitude, that such an one may be ordered to be detained for a term not exceeding three years in a State inebriate reformatory, in addition to, or in substitution of, any other sentence, is a statutory punishment just as is any other statutory punishment for any other crime committed in any other circumstances. But before pronouncing such a sentence, the Court must be satisfied that the offence was committed under the influence of drink, or that drunkenness was a contributory cause, and that the offender himself admits that he is, or has been found by the jury to be, a habitual drunkard. The second class of habitual drunkards, called "repeaters," is composed of those who within twelve months preceding the date of conviction of a fourth offence have been summarily convicted of minor offences, and are to be punished by being detained in any certified inebriate reformatory for not more than three years. These sentences, it is evident, are parallel with those passed upon boys and girls who have got beyond the control of their parents, and who are ordered to be detained in reformatories for like periods. The law, therefore, while it does not transgress any principle affecting the responsibility of those committed, acts on the assumption that such persons are less able to resist the perpetration of offences by reason of their habits, and, therefore, are not mentally sound, although the mental unsoundness does not go the length of actual insanity and irresponsibility. This is indicated by the fact that an offence which, in the case of an occasional offender, would be met by a fine or a few days' imprisonment, becomes, by the mere greater frequency of the same act, one which needs detention for three years in a reformatory. In the law of Austria—Universal Civil Code, Par. 21—it is enacted that in cases of mental infirmity whereby the victims are unable to manage their affairs properly, a curator, after due procedure before the Court, may be appointed by the Court to manage their estate. But the law is also extended to habitual drunkards, morphinomaniacs, and others, who, although admittedly not insane, but simply pyschologically degenerate, are detained at first either in a "Psychiatrische Klinik," or a hospital, and are thence sent to an asylum. The curatory is removed when the person has recovered control, and it may be renewed as often as he lapses. Schlangenhausen affirms that in Austrian asylums the proportion of habitual drunkards to insane varies from 10 to 40 per cent.

SECTION II.

TOXICOLOGY.

CHAPTER I.

LAWS RELATING TO POISONS.

Toxicology means simply the science of poisons. In respect that poisoning is one of the methods by which a murderer seeks to destroy his victim, it is essential that students and practitioners alike should be familiar with the outstanding symptoms and signs of poisoning, not only for the purpose of detecting their symptoms on persons still alive, but also their effects on the examination of the bodies of persons, the causes of whose deaths have been anomalous and obscure, lest poisoning may have been the cause.

What is a poison? To answer this question may seem at first an easy matter, but when the definitions offered are submitted to criticism, it will be found that none will cover the field of their operation, except the definition is made ponderous and unhandy. If we say with Taylor, for example, that a poison is "a substance which when absorbed into the blood is capable of seriously affecting health or of destroying life," then we necessarily exclude such corrosive poisons as the mineral acids and the alkalies which do not kill by being absorbed into the blood, but either by rapid destruction of those parts of the ingestive apparatus with which they come in contact, or by producing such secondary pathological changes in these parts that the mechanical act of ingestion is seriously hindered, or the digestive apparatus is much impaired. Probably the definition by Letheby[1] is one of the best, viz.: "Anything which otherwise than by the agency of heat or electricity is capable of destroying life, either by chemical action on the tissues of the living body, or by physiological action from absorption into the living system." Even to this, however, may be offered with some degree of cogency the objection that it does not include those substances, which developed as products of pathological changes in the body itself, as in uræmia, acetonæmia, cholæmia, and other conditions, none the less certainly cause poisoning. On the other hand, the definition would include all of the poisons which may be exhibited for homicidal purposes, and that is the connection in which the definition is demanded. The law, however, does not demand that a poison should be defined further than it is a substance which if applied to the body, or administered internally, has

[1] Woodman and Tidy, *op. cit.* p. 31.

been applied or administered with the *intention* to kill or do harm. The law on the subject is contained in 24 & 25 Vict. cap. 100.

Section 11 runs thus: "Whosoever shall administer or cause to be administered to or taken by, any person, any poison or other destructive thing with intent to murder, shall be guilty of felony."

Therefore, even although the poison administered, etc., be not followed by bodily injury, either as the effect of prompt treatment or otherwise, if the *intent* to commit murder is proved, the person administering it is held by the law to be guilty of felony.

Section 23 enacts that "Whosoever shall unlawfully and maliciously administer to, or cause to be administered to, or taken by any other person, any poison or other destructive or noxious thing, so as thereby to endanger the life of such person, or so as thereby to inflict upon such person any grievous bodily harm, shall be guilty of felony"; and Section 22, to cover the administration of substances calculated to enable another crime to be committed, ordains that "whosoever shall unlawfully apply or administer to, or cause to be taken by, or attempt to apply or administer to, or attempt to cause to be administered to or taken by any person, any chloroform, laudanum, or other stupefying or overpowering drug, matter, or thing, with intent, in any of such cases, thereby to enable himself or any other person to commit, or with intent, etc., to assist any other person in committing any indictable offence, shall be guilty of felony."

It will, therefore, be apparent from section 23 that if any one administers any poison, or other destructive or noxious thing, to the danger of life or the infliction of grievous bodily harm, he shall be guilty of felony. To meet the possible plea that the substance administered was not intended to endanger life or to inflict grievous bodily harm, and that the substance so administered did neither the one nor the other, section 24, by enacting that if the substance be administered with *intent only to injure, aggrieve, or annoy*, the person administering, etc., shall be guilty of a misdemeanour, makes the act a crime, and closes the last loophole of escape against the culprit. Hence in any case in which it has been proved that a poisonous or noxious substance has been administered, but without the effect of killing, endangering the life, or inflicting grievous bodily harm, and where the intent to do one or other of these cannot be proved to the satisfaction of the jury, they may return a verdict in terms of the last-named section, and convict the administrator of a misdemeanour. The foregoing sections of the Act embrace, it will be observed, a variety of names for the substance administered, viz., *poison, destructive thing, stupefying or overpowering drug*, and *noxious thing*. Moreover, the term "deadly poison" is generally used in indictments in such cases. Since this would not include substances which either in themselves, or in certain quantities would not cause death, but under other circumstances are calculated to do so, it has been ruled by Mr. Justice Erl[1] that this term "deadly poison" should be treated as mere "legal surplusage." The question, too, as to what constitutes a "noxious thing," has been raised in courts of law. There have been at least two rulings on the subject; first, Lord Chief Justice Cockburn and Mr. Justice Hawkins at the Bodmin Assizes, 1877, gave the following ruling in the case of a man who was charged with administering cantharides with criminal intent: that there must not only be an adminis-

[1] *Law Times*, Ap. 12. 1845.

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